

Cameroon's Infrastructure

A Continental Perspective

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Abstract

The poor state of Cameroon's infrastructure is a key bottleneck to the nation's economic growth. From 2000 to 2005, improvements in information and communications technology (ICT) boosted Cameroon's growth performance by 1.26 percentage points per capita, while deficient power infrastructure held growth back by 0.28 points per capita. If Cameroon could improve its infrastructure to the level of Africa's middle-income countries, it could raise its per capita economic growth rate by about 3.3 percentage points.

Cameroon has made significant progress in many aspects of infrastructure, implementing institutional reforms across a broad range of sectors with a view to attracting private-sector participation and finance, which

has generally led to performance improvements. But the country still faces a number of important infrastructure challenges, including poor road quality, expensive and unreliable electricity, and a stagnating and uncompetitive ICT sector.

Cameroon currently spends around \$930 million per year on infrastructure, with \$586 million lost to inefficiencies. Removing those inefficiencies would leave an infrastructure funding gap of \$350 million per year. Given Cameroon's relatively strong economy and natural-resource base, as well as its success in attracting private financing, the country should be able to close that gap and meet its infrastructure goals within 13 years.

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Cameroon's Infrastructure: A Continental Perspective

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Synopsis

Better access to improved infrastructure services is an important engine for economic growth. The poor state of infrastructure is a key bottleneck to growth in African countries, and Cameroon is no exception. Between 2000 and 2005, improvements in information and communication technologies boosted Cameroon's growth performance by 1.26 percentage points per capita, while deficient power infrastructure held growth back by 0.28 percentage points. If Cameroon could improve its infrastructure to the level of the middle-income countries of Africa, the growth effect could be on the order of 3.3 percentage points.

Cameroon has made significant progress in many aspects of infrastructure. Across a broad range of sectors, the country has made serious efforts to implement institutional reforms with a view to attracting private sector investment. Private sector concessions have been awarded for the Port of Douala, the CAMRAIL railway, the national power utility (AES Sonel), and the national water utility (CDE). These arrangements have generally led to performance improvements and attracted significant volumes of finance.

Looking ahead, the country faces important infrastructure challenges.

Cameroon is a key transit country for the landlocked countries of Central Africa. However, significant deficiencies in logistics performance prevent Cameroon from playing this role effectively. Transport costs along the main transit corridors to Chad and CAR are among the highest in Sub-Saharan Africa and transport times are abnormally long. Inefficiencies are caused by poor performance and long dwelling times in the Douala port, excessive numbers of formal and illegal check points, poor road quality as well as governance issues in the management of transport services. Railway and port concessions have produced some improvement but investment needs in the sector remain huge. In the road sector, massive investments on the corridors Douala – Njamena and Douala – Bangui should help improve the current situation; however, the sustainability of these investments is not yet guaranteed due to the lack of an efficient road maintenance system (despite the creation of Cameroon's road maintenance fund financed by an earmarked fuel levy). Finally, in order to produce the full expected results on transit and logistics performance, Cameroon's massive investments in hard infrastructure will have to be complemented by additional reforms on the soft side of trade facilitation (customs reform, transport regulation, Douala single window, etc.).

Power supply remains expensive and unreliable. Cameroon needs to accelerate the development of some of its prime hydropower sites, which would greatly improve the domestic power situation and potentially allow Cameroon to play its natural role as hydropower exporter to the Central African Power Pool.

Cameroon's ICT reform remains frozen at an early stage. The telecom incumbent, CAMTEL, remains state-owned and receives substantial public subsidy. The mobile sector is relatively uncompetitive, operating as a duopoly. Moreover, while Cameroon enjoys access to a submarine cable, CAMTEL's monopoly control over the international gateway has prevented consumers from benefiting.

Addressing Cameroon's infrastructure challenges will require sustained expenditure of \$1,480 million per year over the next decade. More than two-thirds of the required spending (\$1,095 million) is associated with capital investments, and the remaining third with operations and maintenance. Almost one-third of the total spending needs are related to the power sector, followed by water supply and sanitation. The effort that Cameroon would need to make to meet its infrastructure needs is equivalent to 8.9 percent of its gross domestic product (GDP), significantly below the average for Sub-Saharan Africa (14.5 percent).

Cameroon already spends around \$930 million per year on infrastructure, equivalent to 5.6 percent of its GDP. About half goes toward operation and maintenance spending (\$490 million). The transport sector receives the highest level of spending (\$273 million per year), followed closely by the power sector (\$258 million). About half of Cameroon's spending is funded by the public sector. The private sector is the country's largest external financier of infrastructure, with private investment almost commensurate with public investment and significantly higher than official development assistance received from the member countries of the Organisation for Economic Co-operation and Development. Significantly, Cameroon has succeeded in attracting private investment not only into its ICT sector but also into power and water.

Furthermore, some \$586 million are being lost to inefficiencies of various kinds. By far the largest culprit is the power sector, which hemorrhages \$487 million annually through serious underpricing of power and massive distributional losses. By adopting suitable policy measures and institutional reforms, Cameroon could recapture these resources for infrastructure.

After taking inefficiencies into account, a substantial funding gap of \$350 million per year remains. Some \$250 million of the overall funding gap relates to water supply and sanitation and spending needed to meet the Millennium Development Goals. Greater reliance on less costly forms of improved water and sanitation could reduce the funding gap in the sector by about a third.

Given Cameroon's relatively strong economy and natural resource base, as well as its good record with private finance, the country should be able to meet the infrastructure targets outlined here. Perhaps more challenging than raising additional finance, however, will be making the difficult political decisions needed to address the sizeable efficiency gap. But the potential rewards are high. Even without increasing existing spending, Cameroon could meet its spending targets within 13 years just by capturing inefficiencies.

The continental perspective

The Africa Infrastructure Country Diagnostic (AICD) has gathered and analyzed extensive data on infrastructure in more than 40 Sub-Saharan countries, including Cameroon. The results have been presented in reports covering different areas of infrastructure—ICT, irrigation, power, transport, water and sanitation—and different policy areas—including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Cameroon, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Given that Cameroon's economy is heavily

dependent on natural resources, it will be benchmarked against other resource-rich economies in Africa as well as against middle-income countries. Detailed comparisons will also be made with immediate regional neighbors in Central Africa.

Several methodological issues should be borne in mind. First, because of the cross-country nature of data collection, a time lag is inevitable. The period covered by the AICD runs from 2001 to 2010. Most technical data presented are for 2008 (or the most recent year available), while financial data are typically averaged over 2001–06 to smooth out the effect of short-term fluctuations. Second, in order to make comparisons across countries, indicators were standardized so that analyses were done on a consistent basis. This means that some of the indicators presented here may be slightly different from those that are routinely reported and discussed at the country level.

Why infrastructure matters

Between 2002 and 2009 Cameroon's gross domestic product (GDP) grew about 3 percent per year. This economic performance falls short of the 7 percent mark needed to make a significant impact on poverty reduction and below the average growth rate of 6.2 percent for Sub Saharan Africa.

The overall contribution of telecommunications, electricity, and roads to Cameroon's per capita growth between 2000 and 2005 was 1.05 percentage points, mostly attributed to a faster accumulation of infrastructure assets than to improvements in infrastructure quality. As elsewhere, the ICT sector was responsible for most of the contribution, adding 1.26 percentage points to the per capita growth rate. The power sector held back per capita growth by –0.28 percentage points (figure 1a). The dead weight of power on Cameroon's economy is close to three times the negative effect that power deficiencies represented for Africa as a whole during the same period.

Infrastructure's contribution to economic growth in Cameroon was higher than in other Central Africa countries (figure 1a). But in the larger Sub-Saharan African context, infrastructure development led to faster growth per capita in Sudan (1.76 percent), Botswana (1.66 percent), Mauritius (1.67 percent), Benin (1.63 percent), and Uganda (1.54 percent).

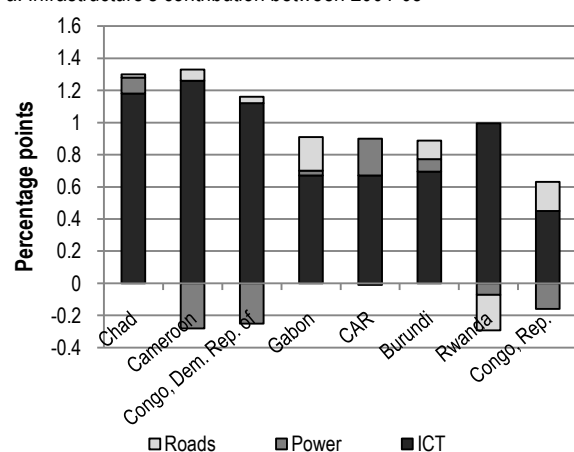
Looking ahead, if Cameroon improves its infrastructure to the level of the middle-income countries in Sub-Saharan Africa, growth performance could be enhanced by as much as 3.3 percentage points per capita (figure 1b).¹ Most of the potential growth would come from the power sector (1.26 percentage points), in particular by increasing its generation capacity and national access rates. ICT would continue making an important contribution to economic prospects (1.25 percentage points), provided the expansion of mobile and internet markets continues. Improving the condition of road corridors would facilitate and increase trade with neighbors, boosting economic growth not only in Cameroon but also in landlocked countries such as Chad and the Central African Republic.

¹The countries that are closer to Mauritius will show the smallest infrastructure gap and will, therefore, have the smallest growth benefits.

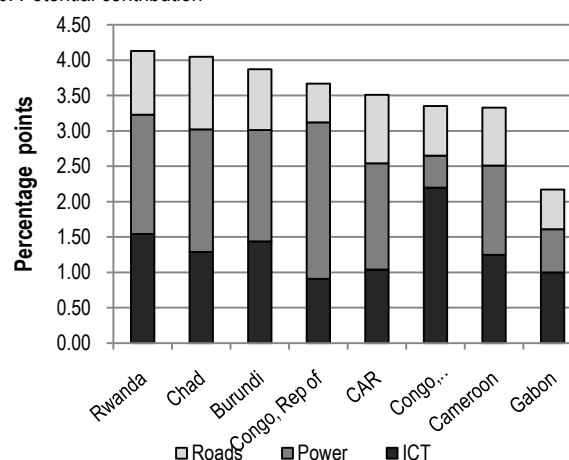
Figure 1. Infrastructure contribution to annual per-capit economic growth In Central African countries

Percentage points

a. Infrastructure's contribution between 2001-05



b. Potential contribution

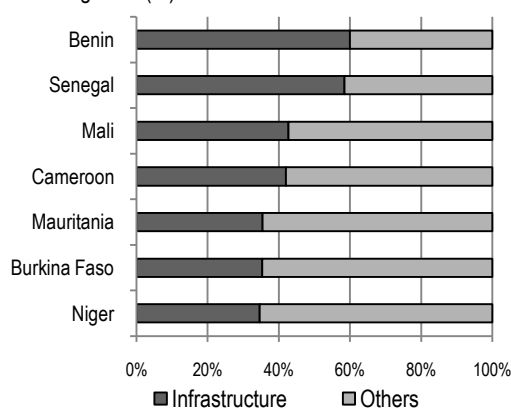


Source: Calderón 2009.

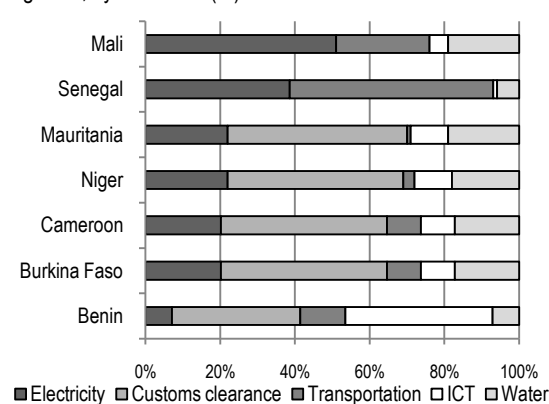
Poor infrastructure is a handicap for business in Cameroon. Evidence from enterprise surveys suggests that infrastructure constraints are responsible for about 42 percent of the productivity gap faced by Cameroonian firms, the remainder being due to poor governance, red tape, and financing constraints (figure 2a). Firms' perception of infrastructure as a bottleneck to growth in Cameroon is typical of countries in francophone Africa. Customs clearance is the infrastructure constraint that weighs most heavily on the country's firms, with power deficiencies in second place (figure 2b).

Figure 2. Infrastructure deficits constrain firms' productivity

a. Degree to which infrastructure is perceived by firms as an obstacle to growth (%)



b. Degree to which infrastructure is perceived by firms as an obstacle to growth, by subsector (%)



Source: Escibano and others 2010.

The state of Cameroon's infrastructure

Despite the country's rich endowment of natural resources, Cameroon's economic growth has been sluggish, and poverty levels remain high. While GDP per capita increased from \$680 in 2000 to \$1,050 in 2007, average poverty remained unchanged at 40 percent over the same period and actually increased in rural areas—where more than 55 percent of rural households are poor (figure 2b).

Cameroon produces about 32 million bbl/year of crude oil, yet extractive industries account for only 8 to 10 percent of Cameroon's GDP. Significant gas and mineral reserves (bauxite, iron, uranium, platinum, gold) remain unexploited (figure 2d). An oil-exporting country, Cameroon felt the impact of the global economic crisis and recently obtained a \$144 million disbursement under the IMF's Exogenous Shock Facility.

Cameroon ranks 164 of 181 in the World Bank's Doing Business Index, and governance issues are important deterrents to increased investment. Corruption is ingrained at all levels of society, with 79 percent of Cameroonians admitting to paying bribes. The country ranks below the 25th percentile on all criteria of the Kaufmann-Kraay Governance indicators, significantly lagging its peers, and ranks 141 out of 180 countries in Transparency International's 2008 Corruption Perception Index. Enforcing a contract takes 43 steps and 800 days. Improving governance is a priority of the government of Cameroon's revised development policy.

Cameroon's 19.5 million people (as of 2009) sparsely populate the country's 475,440 km² (figure 3a). Whereas the average density is 35 inhabitants per square kilometer, there are important differences among regions. In the south and east, the average density is 5 inhabitants per square kilometer, whereas in the west and north population density exceeds 200 inhabitants per square kilometer.

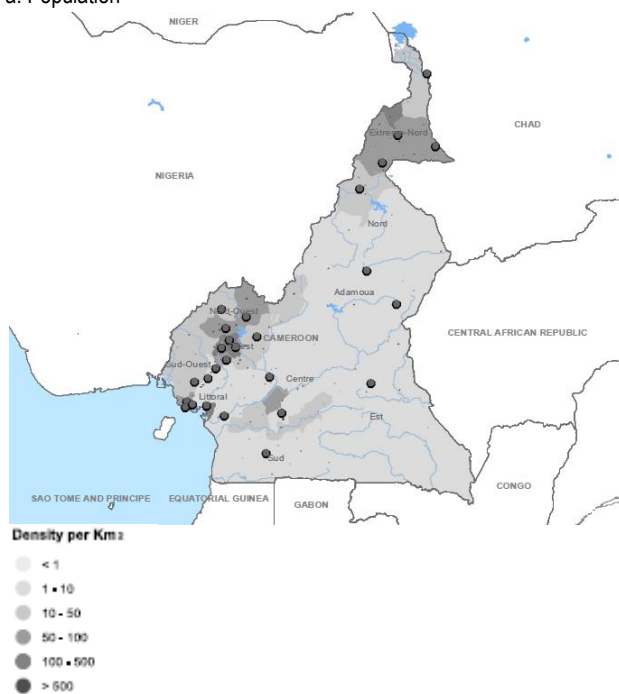
Following the distribution of economic activity and population, the country's roads, power, and ICT backbones are concentrated in urban areas, in particular around Douala and Yaoundé. About 50 percent of Cameroon's population live in urban areas, which account for the largest share of the country's economy. Urban population growth remains high—more than 4 percent per year versus 2.3 percent in the country as a whole, with peaks of 7 percent in Yaoundé and 6.5 percent in Douala. In the past 15 years, urban population growth has been absorbed by poor housing spreading out from the edges of towns, with growing density in low-income neighborhoods near city centers. Most of the urban sprawl has occurred without links to infrastructure and with poor access to basic services. The current urban infrastructure stock is almost the same as it was at the end of the 1980s, while the population has more than doubled. Nearly 70 percent of the urban population, and all of the poorest urban inhabitants, have no access to public utilities or basic services (World Bank 2010b).

But beyond urban areas, Cameroon has managed to develop natural backbones for roads, rails, power, and ICT networks, especially by the standards of Central Africa (figure 4). For instance, there is a visible North-South axis, and greater density on coastal areas. However, regional connectivity with Nigeria and the rest of Central Africa remains limited.

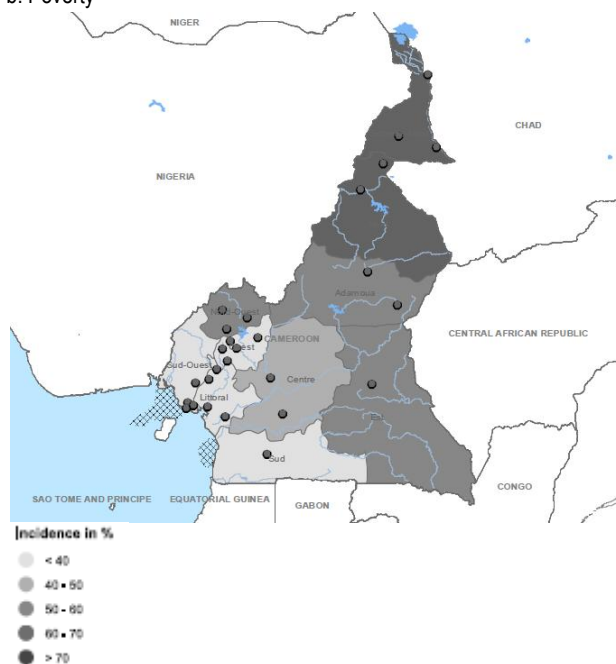
CAMEROON'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Figure 3. Cameroon's is sparsely populated and with high poverty incidence

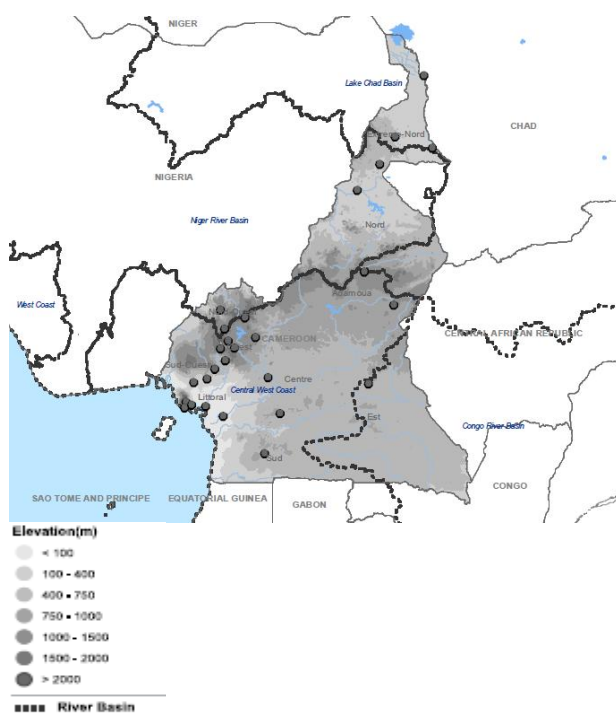
a. Population



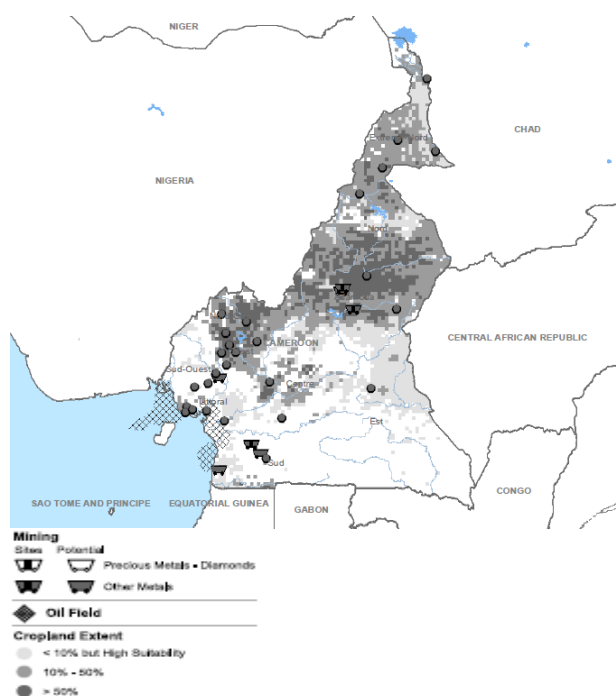
b. Poverty



c. Topography



d. Natural resources

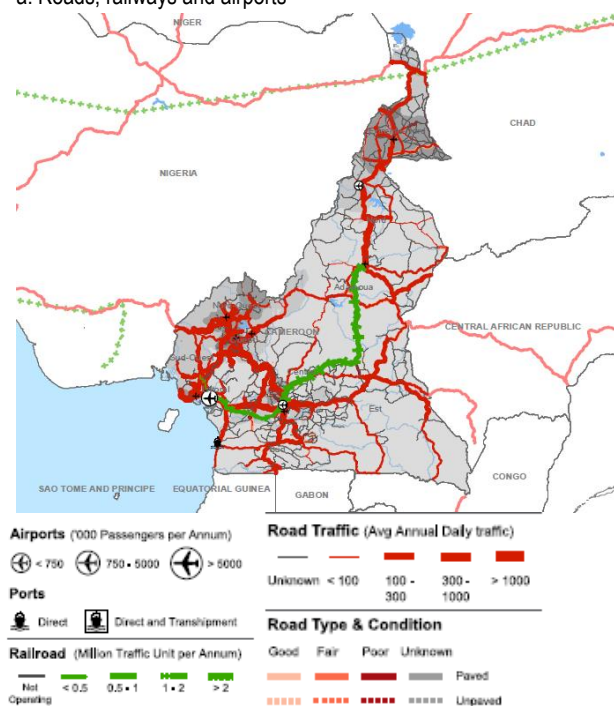


Source: AICD Interactive Infrastructure Atlas for Cameroon downloadable from http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf

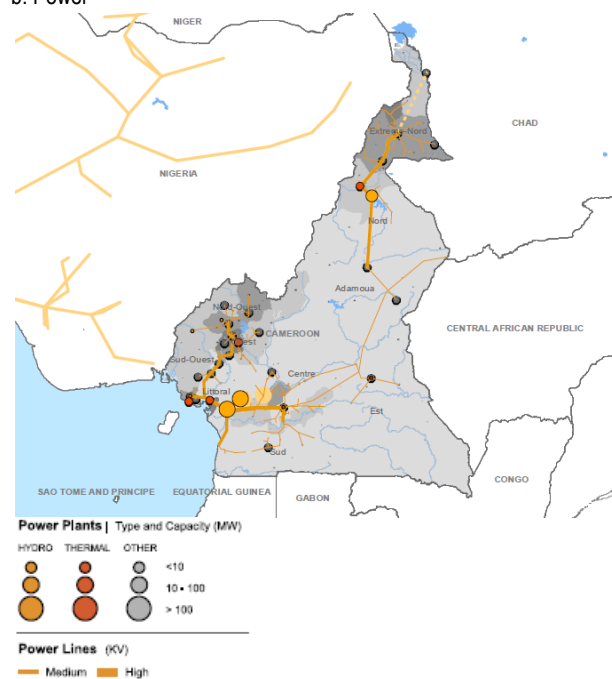
CAMEROON'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Figure 4. Cameroon's infrastructure networks follow population density and natural resources

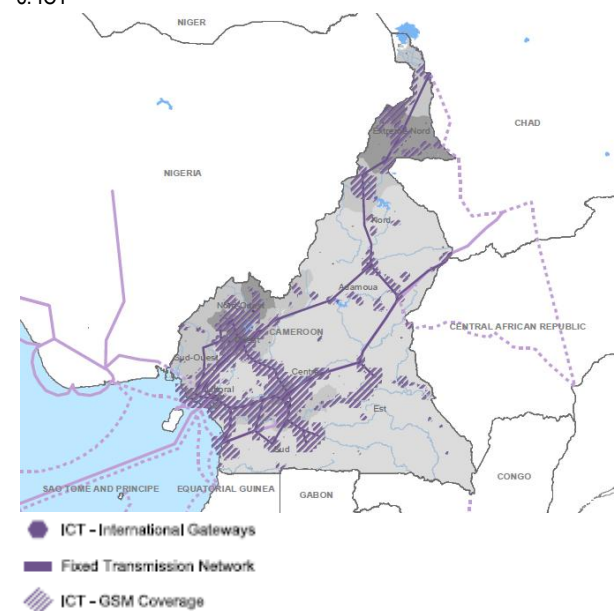
a. Roads, railways and airports



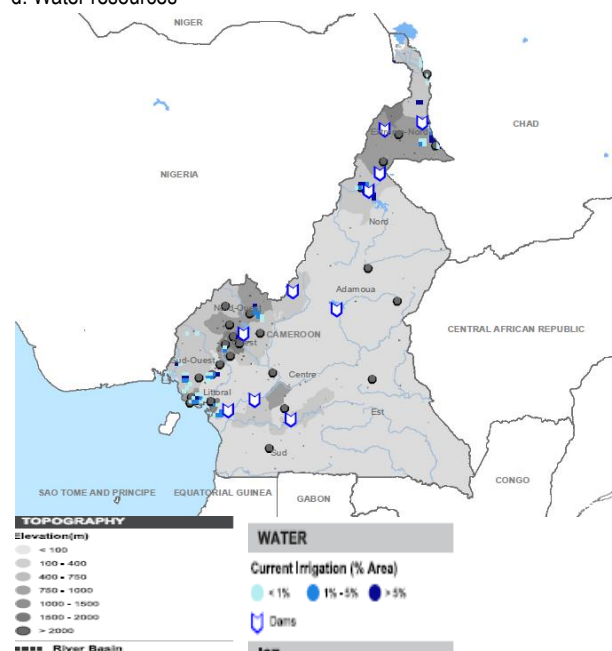
b. Power



c. ICT



d. Water resources



Source: AICD Interactive Infrastructure Atlas for Cameroon downloadable from http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf

The main achievements and challenges in each of the Cameroon's major infrastructure sectors are summarized in table 1. The table highlights the need for upgrading infrastructure in all subsectors, notes the obstacles to enhancing the coverage and quality of infrastructure services, mentions ambitious reform efforts in this area, and reveals the need to improve the operational and financial performance of state-owned enterprises such as AES Sonel. The following section discusses these achievements and challenges in more detail, by sector.

Table 1. Achievements and challenges in Cameroon's infrastructure sectors

	Achievements	Challenges
Transport	Relatively high private sector participation	Boosting Logistic Performance Index Improving the quality and efficiency of its infrastructure to reduce costs of trade for Chad and the CAR
Roads	Average road network density and rural accessibility to all-season roads Fuel levy more than maintenance need norm	Improving the condition of the road network, in particular in regional corridors Spending maintenance funds more effectively and securing finance for road rehabilitation
Ports	Port sector reform Private sector participation Relatively good performance of the port of Douala in the context of west African coast	Expanding the capacity of ports
Railways	Relatively high performance of CAMRAIL	Update rolling stock and rehabilitate tracks
Air transport	Turnaround of traffic and connectivity Competition in market	Boosting domestic market
Irrigation	Large potential for small-scale projects	Increasing irrigated area
Water and sanitation	Reduced reliance on surface water and open defecation Improvements in operational performance following sector reform	Furthering sector reform Closing gaps in access between urban and rural areas Developing sanitation systems
Power	Relatively high access to electricity Reform of the sector, which led to the privatization of AES Sonel and increase in connections Increase in generation capacity	Improving financial and operational performance by AES Sonel Increasing reliability of power supply Expanding power trade
ICT	Rapid expansion of the mobile and fixed-line markets	Furthering reform of the sector Expanding Internet market

Source: Authors' elaboration based on findings of this report.

Note: ICT = information and communications technology. CAR= Central African Republic

Transport

Owing to its strategic location neighboring Nigeria and Gabon, and as a potential crossing point to the landlocked countries of Central Africa (Chad and the Central African Republic), Cameroon is a natural hub for the region, with the port of Douala as the main entrance. Douala is also the starting point of the CAMRAIL railway, which extends 1,100 kilometers toward Chad but stops short of the border. The Douala-Bangui and the Douala-Ndjamena corridors are essential to the landlocked countries and provide greater trade integration within the subregion of the Economic Community of Central African States (CEMAC). However, Cameroon's transport sector suffers from the absence of a coordinated approach to intermodal transport.

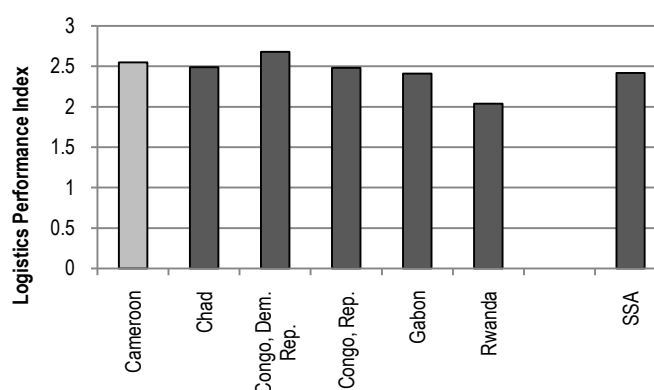
Because of the poor condition of its road network and delays in the port of Douala, Cameroon's ability to move goods and connect manufacturers and consumers with international markets is one of the lowest in the world. Feedback on the logistics "friendliness" of countries is reflected in the Logistics Performance Index (LPI). The Logistics Performance Index is based on a worldwide survey of global freight forwarders and express carriers, who provide feedback on the logistics "friendliness" of the countries in which they operate. In 2010, Cameroon's LPI, at 2.55, ranked 105 out of the 155 countries assessed by the LPI. Even so, it was still above the Sub-Saharan Africa average (2.42) and the highest among Central African countries (figure 5).

Zooming in on the components of the LPI, in the case of Cameroon the quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology) and the efficiency of clearance (speed, simplicity, and predictability of formalities) by border control agencies, are the dimensions that received the lowest scores by operators in the country.

Transporting goods from port to final destination across Central Africa is even more costly than in other regions of Sub-Saharan Africa, which are already costly compared to the rest of the developing world. Moving freight along intraregional corridors in the Central African region² costs twice as much as in southern Africa,³ where distances are significantly longer. Moving a metric ton (tonne) of freight from port to hinterland destination costs between \$230 and \$650 along intraregional corridors in Central Africa, compared with \$120 to \$270 in southern Africa (AICD 2010b). In fact, transport costs in Central Africa remain among the highest in Sub-Saharan Africa at \$0.11 to \$0.26 per tonne-km, compared with \$0.06 to \$0.08 in West Africa (Lomé-Ouagadougou and Cotonou-Niamey) and East Africa (Mombasa-Kigali and Mombasa-Kampala), and (\$0.05 to \$0.06 in Southern Africa (Durban-Lusaka and Durban-Ndola) (World Bank 2011c).

Within Central Africa, there is a huge cost differential in transporting freight between coastal countries (such as Cameroon) and landlocked countries such as (Central African Republic and Chad). This reflects the fact that final destinations in coastal countries tend to be relatively close to the sea, and the costs of crossing an international land border are avoided. For these reasons, freight transport costs to and from Cameroon are among the lowest in Central Africa at \$1,379 per container, even if they remain very high in absolute terms.⁴ The average time to export and import is 23 and 26 days, respectively (table

Figure 5. The Logistics Performance Index in Central African countries



Source: World Bank 2010a.

² Comprising Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon.

³ Comprising Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe

⁴ Cost measures the fees levied on a 20-foot container in U.S. dollars. For more on the methodology behind the figure on trading across borders see World Bank 2011c.

2). By comparison, the cost and time of trading to and from the Central African Republic and Chad are substantially higher. For instance, it costs \$8,150 to import a contained to Chad and \$5,554 to the Central African Republic. The result is that basic goods are considerably less expensive in the Cameroon than in Chad and the Central Africa Republic.

The high costs and lengthy delays in trading to and from the landlocked countries are due to several barriers in the international corridors. Surface transport costs and travel times in the corridor connecting Cameroon to Chad and the Central African Republic (Douala-Ndjamena and Douala-Bangui) are among the highest in Sub-Saharan Africa.

Expensive surface transport costs along the corridors account for the bulk of the cost of importing to the Central African Republic. Inland transport cost in the Douala-Bangui, Douala-Ndjamena, Pointe Noire-Brazzaville-Bangui corridors account for up to 65 percent the total cost of importing (figure 6a).

Table 2. Trading across borders in Central African countries

Country	Documents required to export (number)	Time to export (days)	Cost to export (\$ per container)	Documents required to import (number)	Time to import (days)	Cost to import (\$ per container)
Burundi	9	47	2,747	10	71	4,285
Cameroon	11	23	1,379	12	26	1,978
Central African Republic	9	54	5,491	17	62	5,554
Chad	6	75	5,902	10	101	8,150
Congo, Dem. Rep.	8	44	3,505	9	63	3,735
Congo, Rep.	11	50	3,818	10	62	7,709
Equatorial Guinea	7	29	1,411	7	48	1,411
Gabon	7	20	1,945	8	22	1,955
Rwanda	8	35	3,275	8	34	4,990
São Tomé and Príncipe	8	27	690	8	29	577
Central Africa	8	40	3,016	10	52	4,034
Sub-Saharan Africa	8	32	1,962	9	38	2,492

Source: World Bank 2011a.

Note: Documents required to export (import): The number of documents required per shipment to export (import) goods. Taken into account are documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies, and banks.

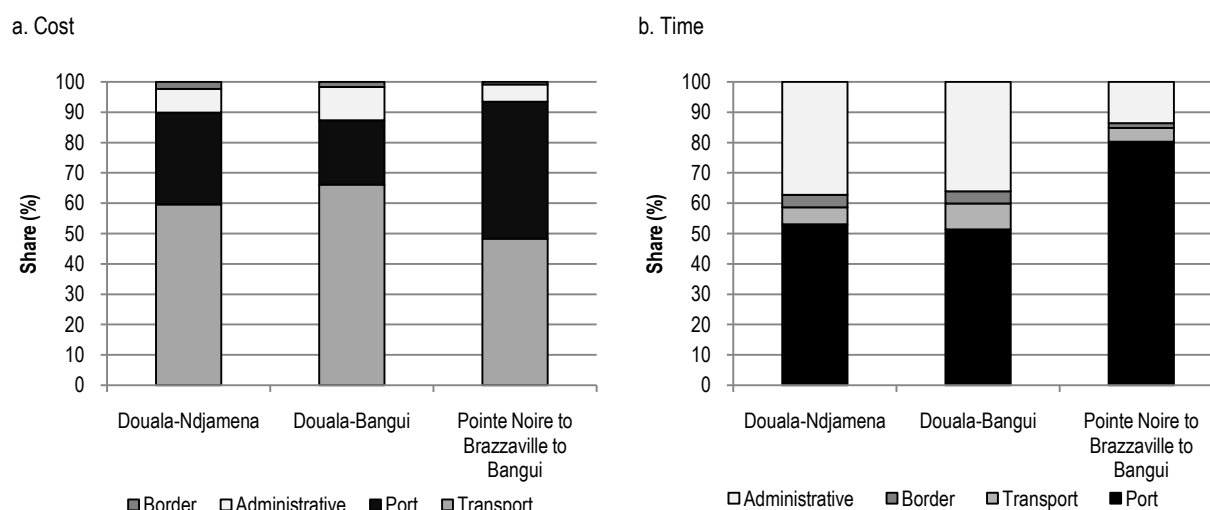
Time to export (import): The time necessary to comply with all procedures required to export (import) goods. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen.

Cost to export (import): The cost associated with all procedures required to export (import) goods. Includes the costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal-handling charges, and inland transport.

Surface transport costs are highly influenced by the strong presence of freight bureaus and transport associations that prevent truck operators from contracting directly with customers and result in high profit margins for the trucking industry. The regulatory framework—based on market sharing, centralized allocation of freight, and limits on vehicle mileage (around 2,000 kilometers per month versus 12,000 in the developed world)—weakens incentives to invest in service quality upgrades. As a result, the truck fleet is largely composed of poorly maintained second-hand trucks that are typically overloaded to obtain

maximum revenue from their restricted usage. This is a serious problem in the region, one that results in too many vehicles chasing modest overall freight volumes.

Figure 6. Time and cost of importing through alternative gateways involving Cameroon



Source: Teravaninthorn and Raballand 2009.

Note: The Pointe Noire-Brazzaville-Bangui corridor is included in the analysis because it runs through Cameroon.

Lengthy travel times in the Douala-Bangui and Douala-Ndjamena corridors are mainly associated with delays in the port of Douala, which is operating at the limit of its capacity. In 2010, transporting an 18-tonne, 40-foot container between Douala and N'Djamena took between four weeks and two months (World Bank 2011c). Port procedures are responsible for half of the time required to import to the Central African Republic and Chad. Productivity measures in the port of Douala are at the level of other regional ports, but behind the Sub-Saharan average (see section on ports). Time-consuming regulatory processes related to customs clearance and technical controls account for about one-third of the total time required for clearance (figure 5b). New port investments are on going on Kribi and Limbé but a comprehensive logistics strategy is still missing to address the growing demand for transport services (which may further accelerate in the mid-term if some major mining projects materialize).

Other nonphysical barriers and logistical inefficiencies play a major role in travel times. 2009 surveys of corridor operations reported between 70 and 150 checkpoints (legal and illegal) between Douala and N'Djamena and 45 between Douala and Bangui (World Bank 2011c). On a return trip between Douala and N'Djamena, transporters pay on average the equivalent of \$580 in legal charges and illegal bribes. Another major obstacle to trade facilitation in the CEMAC region is institutional weakness at the regional level and to some extent at national level (World Bank 2011c).

Due to the physical and non-physical barriers, trade in the subregion is the lowest in Sub-Saharan Africa—but it is slowly increasing. With interregional trade accounting for just 0.5 to 1 percent of the total trade of its member states, the CEMAC subregion is the least integrated in Sub-Saharan Africa, far behind the Common Market for Eastern and Southern Africa (COMESA, 5 percent), the Southern African Development Community (SADC, 10 percent), the Economic Community of West African States (ECOWAS, 10 percent), and the West African Economic and Monetary Union (UEMOA, 15 percent). Between 2005 and 2008, annual flows of freight between Cameroon, Chad, and the Central

African Republic increased by about 10 percent from 1.31 to 1.43 million tonnes. The bulk of trade flows are from Cameroon to Chad (452,000 tonnes, of which 76,000 tonnes for gasoline and 64,000 for containers) and from the Central African Republic to Cameroon (252,000 tonnes, of which 237,000 tonnes of wood). Flows from Cameroon to the Central African Republic amount to 126,000 tonnes (of which 21,000 tonnes for gasoline and 20,000 for containers) while flows from Chad to Cameroon (57,000 tonnes), mostly involve cotton exports (49,000 tonnes) (World Bank 2011c).

Roads

Achievements

Cameroon's road density is greater than that of peers. The density of the country's total road network is 72 kilometers per 1,000 km², higher than the average for Africa's resource-rich countries at 59 kilometers per 1000 km². But Cameroon's road density is still behind the level of the continent's middle-income countries, which have an average of 318 kilometers per 1,000 km² (table 3).

Twenty-seven percent of Cameroon's rural inhabitants have access to all-season roads, as measured using geographic information system (GIS) tools, slightly above the average GIS rural accessibility in resource-rich countries. But evidence from household surveys suggests that 51 percent of the rural population lives within 2 kilometers of an all-season road (table 3).

Table 3. Cameroon's road indicators benchmarked

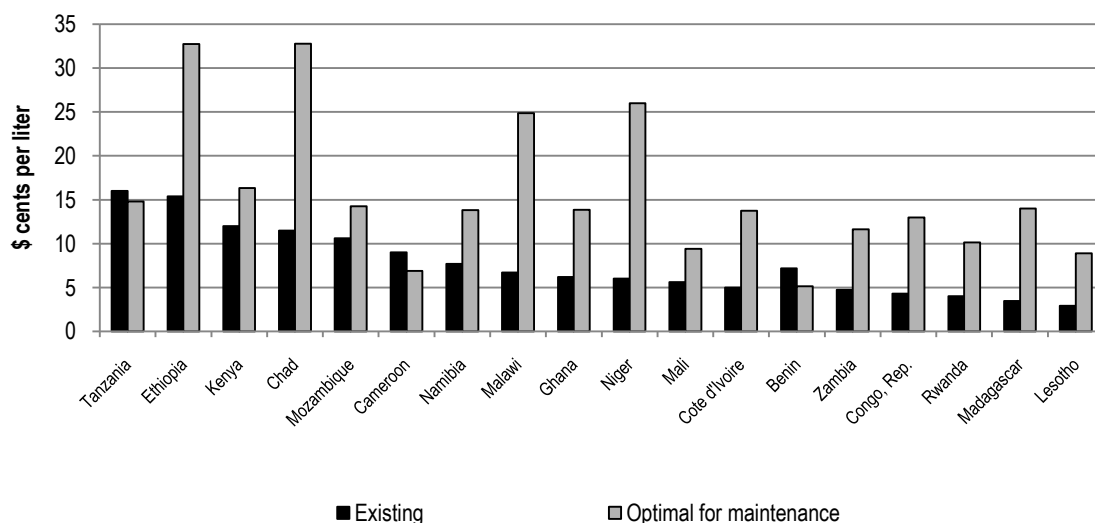
Indicator	Unit	Resource-rich countries	Cameroon	Middle-income countries
Road network density [a]	km/1000 km ² of land area	59	72	318
Classified road network density	km/1000 km ² of land area	38	51	278
GIS rural accessibility	% of rural pop within 2 km from all-season road	26	27	31
Household survey rural accessibility	% of rural pop within 2 km from all-season road	36	51	63
Classified paved road network condition [b]	% in good or fair condition	68	52	82
Classified unpaved road network condition	% in good or fair condition	61	65	58
Classified paved road traffic	Average annual daily traffic	1,402	1,099	2,558
Classified unpaved road traffic	Average annual daily traffic	25	60	75
Primary network overengineering	% of primary network paved with 300 AADT or less	20	16	18
Primary network underengineering	% of primary network unpaved with 300 AADT or more	9	36	20

Source: AICD 2010b.

Note: a. Total network includes the primary, secondary, and tertiary networks.

b. Classified roads are the roads that have been included in the roads legislation as public roads.

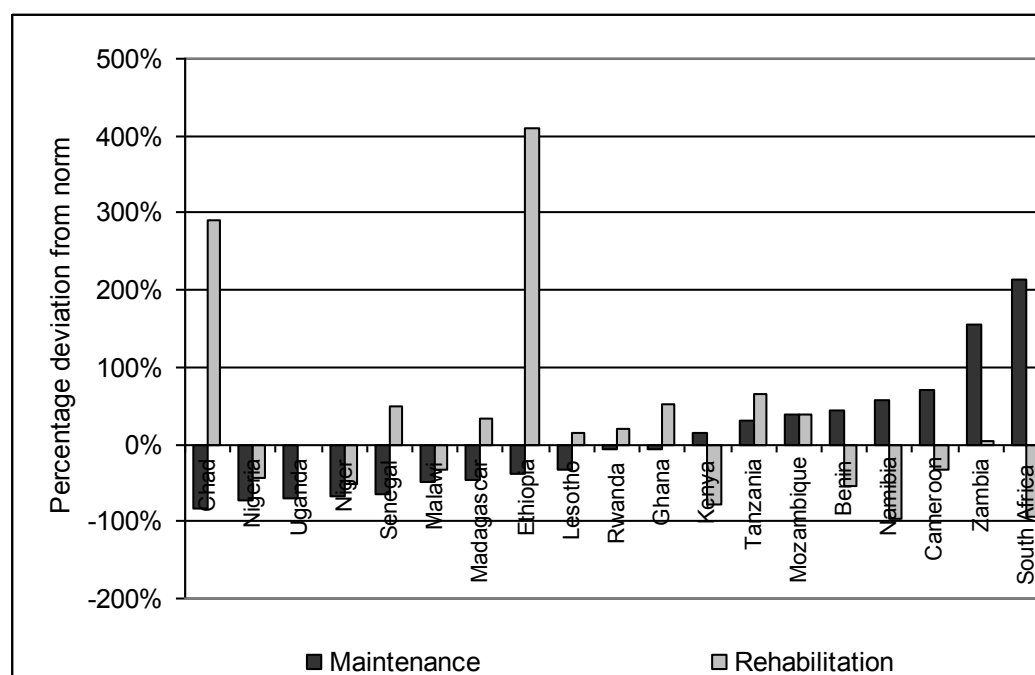
The existing fuel levy is set at an adequate level to cover road maintenance needs in Cameroon. At 9 cents per liter, Cameroon's fuel levy is relatively high compared with other Sub-Saharan African peers (figure 7).

Figure 7. Optimal and existing fuel levy in selected countries of Sub-Saharan Africa

Source: Gwilliam and others 2008.

Compared to other African peers, Cameroon does not appear to be underspending on road maintenance. This analysis is based on the assumption that road maintenance services can be purchased at an efficient standardized unit cost. To the extent that the unit costs of road maintenance in Cameroon are above this benchmark level, maintenance *effort* could remain inadequate despite the apparent adequacy of *spending* levels. Current levels of capital spending in Cameroon fall well below what is needed to clear rehabilitation backlogs within a reasonable five-year period (figure 8).⁵

⁵ Using the RNET model, it is possible to produce detailed estimates of the rehabilitation requirements for each country's road network taking into account the current distribution of network condition and working toward a target of clearing the current rehabilitation backlog within a five-year period. On that basis, the rehabilitation requirements can be compared with the current levels of capital expenditure to determine whether these are high enough to eliminate the rehabilitation backlog within a reasonable period of time. The calculation is helpful in illustrating whether current levels of capital expenditure would be high enough to address the rehabilitation problem if they were fully allocated to rehabilitation works (Gwilliam and others 2008).

Figure 8. Countries' spending on rehabilitation and maintenance, relative to norms

Source: Gwilliam and others 2008.

Challenges

In spite of adequate levels of road financing, maintenance activities are poorly planned and ineffective in optimizing the life cycle of road assets. A recent audit of the maintenance contracts financed by the country's road maintenance fund found that only about 45 percent of civil works scored good or fair in technical quality (World Bank 2011c).

These deficiencies in maintenance have left Cameroon's road network in relatively poor condition. The condition of the country's classified paved road network is below the level of peer countries, with only 52 percent of the classified paved network in good or fair condition versus 68 percent in Africa's resource-rich countries and 82 percent in middle-income countries (table 3). The quality of the roads hobbles the private sector. About one in three firms in Cameroon identified roads as a major constraint for doing business, slightly above the average for similar resource-rich countries (at 30 percent), but almost twice the level in middle-income countries (at 18 percent).

The quality of Cameroon's sections of critical regional corridors is also poor, especially when compared with sections in neighboring countries. That weakness prevents landlocked countries from moving goods and people efficiently. Cameroon has sections in four regional corridors: Douala-Bangui, Douala-Ndjamena, Pointe Noire-Brazzaville-Bangui, and Nouakchott-Ndjamena. The Cameroon sections of the Douala-Bangui, Pointe Noire-Brazzaville-Bangui, and Douala-Ndjamena corridors are still not completely paved. Although some sections of the Douala-Bangui corridor are being upgraded as part of the CEMAC Transport Transit program, about 250 kilometers in Cameroon (and 210 kilometers in the Central African Republic) are surface pavement treated. All of Cameroon's section in the Pointe Noire-Brazzaville-Bangui corridor (308 kilometers) is unpaved (as are 1,000 kilometers in the Congolese side).

Only 67 percent of the Douala-Ndjamena corridor is paved. This means that neither the Central African Republic nor Chad can rely on these corridors as all-weather connections to the sea (table 4).

Furthermore, only 48 percent of the Douala-Bangui corridor, 21 percent of the Pointe Noire-Brazzaville-Bangui corridor, and 52 percent of the Douala-Ndjamena corridor are in good condition. In each of these cases the problem seems to lie in the neglect of road quality by Cameroon. Only 30 percent of the Cameroonian section in the Douala-Bangui corridor is in good condition, against 100 percent of the Central African section. A World Bank project currently underway aims to substantially improve the quality and efficiency of this corridor; most recent data suggest that as of 2011 60 percent of the corridor was in good condition.

Similarly, only 56 percent of Cameroon's section of the Pointe Noire-Brazzaville-Bangui corridor is in good condition (and none of the Republic of Congo's section is in good condition), whereas 100 percent of the section in the Central African Republic is in good condition. All of the Douala to Ndjamena corridor is located in Cameroon (table 4). Clearly, the incentives for Cameroon and other coastal countries to maintain hinterland road corridors are not very strong. Coastal countries' economies are typically concentrated along the coast, making the up-country segments regional public goods.

Table 4. Condition and type of road corridors passing through Cameroon

Corridor	Type (%)		Condition (%)			Average annual daily traffic (%)		
	Paved	Unpaved	Good	Fair	Poor	<300	300-1000	>1000
<i>Douala to Bangui</i>	69	31	48	25	25	65	20	15
Cameroon	52	48	30	36	35	53	24	23
Central African Republic [a]	100	0	100	0	0	86	14	0
<i>Pointe Noire to Brazzaville to Bangui</i>	40	54	21	21	49	27	11	0
Cameroon	0	100	56	39	0	70	24	0
Central African Republic [a]	99	1	100	0	0	79	19	0
Republic of Congo	28	63	0	21	69	0	6	0
<i>Douala to Ndjamena [b]</i>	67	33	52	48		26	49	25
Cameroon	67	33	52	48		26	49	25
<i>Nouakchott to Ndjamena</i>	97	3	46	43	10	10	46	43
Mauritania	100	0	22	79	26	0	22	79
Senegal	29	71	100	0	63	0	100	0
Mali	94	6	76	16	0	6	76	16
Burkina Faso	100	0	38	56	0	6	38	56
Niger	99	1	47	49	29	4	47	49
Nigeria	100	0	0	100	-	0	0	100
Cameroon	100	0	57	13	30	31	57	13

Source: AICD calculations; AICD 2010a; AICD 2010b; World Bank 2011c.

Note: The summation of the good, fair, and poor condition not necessarily add up to 100 since there might be some links the condition of which is unknown. The summation of the paved and unpaved type does not necessarily total 100 as the type of some links may be unknown.

a. Asphalt and surface treatment pavements are considered paved roads.

b. The condition of the Douala to Ndjamena corridor is from World Bank (2011c).

The relatively poor condition of the corridors in the coastal countries calls for further regional coordination and collaboration. The adoption of the Trade and Transport Facilitation Program by the CEMAC member states goes in this direction. The program comprises the implementation of a regional institutional framework; harmonization of national regulations; interconnectivity of customs information technology systems within the region; and implementation of a pilot trade and transport facilitation project on the Bangui-Douala (about 1,450 kilometers) and Douala-Ndjamena (about 1,850 kilometers) corridors. Traffic levels in Cameroon are low compared with those of peers, making it difficult to justify heavy road engineering in the paved network. Traffic over the paved network is only 1,099 vehicles per day—against 1,402 vehicles in the continent's resource-rich countries and 2,558 in middle-income countries. Traffic over the unpaved network is 60 vehicles per day, higher than 25 vehicles in resource-rich countries, below 75 vehicles in the middle-income countries, but still low in absolute terms. With 16 percent of the paved primary network having an average annual daily traffic of fewer than 300 vehicles, Cameroon's road network shows some evidence of overengineering—by close to 18 percent compared with countries with comparable resources (see table 3).

In particular, most of the traffic in the Bangui-Douala and Pointe Noire-Brazzaville-Bangui corridors is concentrated in the fewer-than-300-vehicles-per-day band. Around 53 percent of the Cameroon section of the Douala-Bangui corridor carries fewer than 300 vehicles per day, the estimated minimum economic threshold for paving. In the case of the Pointe Noire-Brazzaville-Bangui corridor, about 70 percent of Cameroon's section carries fewer than 300 vehicles per day. It may be that traffic volumes have been artificially depressed by recent conflicts.

The level of traffic over Cameroon's unpaved network justifies the paving of some of its roads. Around 36 percent of the unpaved network in Cameroon carries more than 300 vehicles per day, the estimated minimum economic threshold for paving. Indeed, traffic over the unpaved network in Cameroon, at 60 vehicles per day, is more than twice the average for the resource-rich countries and relatively close to the level for the middle-income countries (see table 3).

Increasing road safety in Cameroon is a significant challenge. A recent study revealed that between 2004 and 2007 the accident rate of 60 deaths per 10,000 vehicles on the Douala-Yaoundé road was 35 times higher than on a similar road in Europe. While human behavior is responsible for three-quarters of the accidents, some infrastructure "black spots" were also identified. Car crashes not only cost lives and cause injuries; they also have an economic cost that adds up to the high transport and transit costs along the corridor. It has been estimated that the direct and indirect impact of deteriorated safety conditions in developing countries such as Cameroon typically amount to about 1.5 percent of GDP (World Bank 2011c).

Ports

Achievements

Cameroon has embarked on a new national ports master plan for the period 2008–33. The plan is seen as a step toward the development of the Cameroon ports system, which will encompass existing port facilities and a new deep-sea port.

Cameroon has managed to attract private sector participation into some sections of the ports. APM Terminals is a stakeholder in the Douala container terminal, having been selected to manage and operate the facility on a concession basis for a period of 15 years beginning in July 2004. The Port Authority of Douala is also a stakeholder. The private sector also has a strong presence in the ownership, management, and operation of the specialized liquid-bulk export terminals. Despite the strong presence of the private sector in container operations in Douala, greater involvement of the private sector could be achieved as part of wider institutional reforms.

Traffic in Cameroon's ports increased substantially in the period 1996–2005 but remained relatively light in comparison with other ports along the western coast of Africa. Container traffic in the port of Douala nearly doubled between 1996 and 2005, rising to a volume of 190,700 TEU in the last year (figure 9a), still short of the capacity of 270,000 TEU. General-cargo traffic also grew substantially in Douala, rising from a level of 3.8 million tonnes in 1995 to 5 million in 2006. Dry-bulk traffic in the port, while smaller in volume than other cargo types, chalked up the highest rate of growth—from 100,000 tonnes in 1995 to 500,000 tonnes in 2006. The cargo handled by the port of Douala is comparable to that of the port of Cotonou but behind the level of the ports of Abidjan (Côte d'Ivoire), Lomé (Togo), Tema (Ghana), Luanda (Angola), and Apapa (Nigeria) (table 5). Nonetheless, Douala is the most important regional port of Central Africa, as it handles transit traffic for Central African Republic and Chad.

Table 5. Port indicators for selected ports

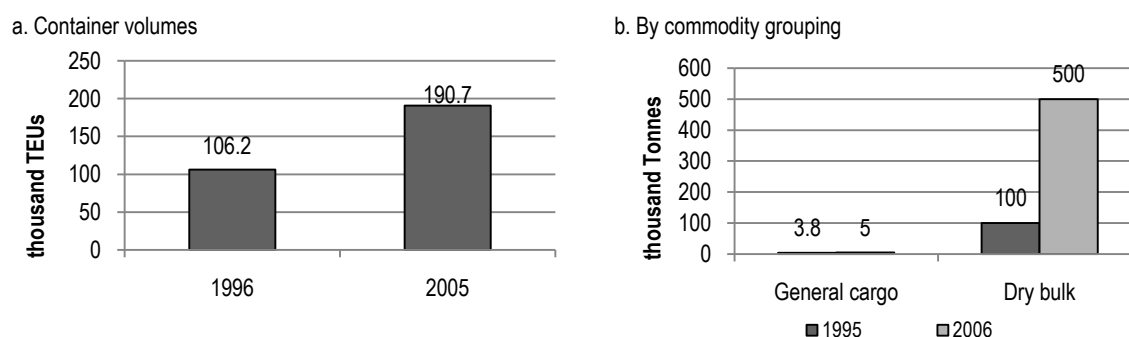
	Douala Cameroon	Abidjan Côte d'Ivoire	Apapa Nigeria	Cotonou Benin	Harcourt Nigeria	Lomé Togo	Luanda Angola	Pointe Noire Congo	Tema Ghana
Containers handled (TEU per year)	190,700	500,119	336,308	158,201	7,900	460,000	377,208		420,000
Crane productivity, container (containers per hour)	18.5	18	12				6.5	6.5	13
Crane productivity, general cargo (tonnes per hour)		16	9	15	8	22.5	16	7.5	13.5
Dwell time, container (days)	12	12	42	12		13	12	18	25
Turnaround time, truck processing time for receipt and delivery of cargo (hours)	12	2.5	6	6		4	14	12	8
Pre-berth waiting time, general cargo (hours)		2.9	36	48	38.4		144	43.2	9.6
Pre-berth waiting time, bulk dry (hours)	1.5	1		48					6
Pre-berth waiting time, container (hours)	1.6	1	12	24		1	96	38.4	12.4
Handling charge, bulk dry (\$ per tonne)	6	5		5		5	5	2.75	3
Handling charge, cargo container (\$ per TEU)	220	260	155	180		220	320	140	168
Handling charge, general cargo (\$ per tonne)	6.5	13.5	8	8.5	8	9	8.5	5.5	10

Source: AICD ports database downloadable from <http://www.infrastructureafrica.org/aicd/tools/data>.

Note: Data are as of 2006.

—= data not available.

TEU = 20-foot equivalent units.

Figure 9. Port demand in Cameroon

Source: Ocean Shipping Consultants 2009.

TEU = 20-foot equivalent units.

Compared to other ports on the west coast of Africa, the Port Douala is one of the most efficient, particularly in handling containers. But still it lags behind the average port in Sub-Saharan Africa. Container crane productivity, at 18.5 containers per hour, was the highest among ports along the west coast in 2005 (matched only by the port of Abidjan, which may have deteriorated since with the return of conflict in Côte d'Ivoire), but not even half the Sub-Saharan African average. Container dwell time and truck turnaround time, at 12 days each, are the lowest in the region, versus 7 days for an average port in Sub-Saharan Africa. After Abidjan, the pre-berth waiting time for containers (1.6 hours) is the lowest among ports in this part of Africa. In the other cargo sectors, performance is consistent with the norms for the region and, as such, there is room for significant improvement as the performance of the ports in this part of the continent trails the average for Sub-Saharan Africa port. Further privatization of the customs clearance system and expansion of the port might help improve the performance of the port of Douala.

Challenges

Further implementation of Cameroon's economic reform program—complementing exploitation of Cameroon's natural wealth, including its forestry and mining resources (notably bauxite, iron, cobalt, nickel, rutile), natural gas, and hydrocarbon products—will boost growth and increase the demand for port facilities. The capacity of the country's ports is being stretched as demand for services rises, leading to longer transit times to Chad and the Central African Republic. Overall the four ports in Cameroon have a capacity of close to 7 million tonnes per year; in 2006 they handled in excess of 6 million tonnes of cargo annually—with Douala accounting for over 95 percent of this.⁶ The available capacity remaining in the port system is relatively tight, and to a significant extent does not match the requirements of modern shipping. The port of Douala is quickly approaching its available capacity, and none of the other public ports offers a viable alternative, at least in their current form. It is against this background that the formulation of a new national ports master plan that will add modern new port capacity is essential.

Port and cargo-handling costs in the port of Douala are at the higher end of charges paid along the West African coastline, which in turn are higher than elsewhere in Africa. The handling charge is \$220 per TEU for containers and \$6.5 per tonne of general cargo (table 5). To some extent, though, this must

⁶ Douala is the largest port in terms of volume handled; Kribi is a distant second, followed by the much smaller ports of Limbe and Garoua.

be viewed as a natural outcome of the tight balance between available capacity and demand and the lack of broad-based institutional reform, which has perpetuated built-in inefficiencies and structural problems. Capacity expansion and wider institutional reforms offer the route to lower port and cargo-handling costs.

More generally, the charges levied in Central African ports do not compare favorably with the rest of Africa; let alone with global best practice. Compared with global best practice, Africa's ports are generally expensive to use and subject to extensive delays. Southern African ports tend to perform somewhat better than those in other regions across a range of parameters. The services provided by Central and West African ports generally cost twice as much as those in other global ports. Unlike in Central Africa, most southern African terminals offer a given number of free days' storage—typically up to seven days—and thereafter apply a daily storage charge, sometimes on a sliding scale that increases as the number of days increases.

Finally, the port of Douala is not yet ISPS-code compliant. In 2006 the port introduced a container-scanning device. At the beginning of 2007 new automated customs procedures went into effect. However, the authorities estimate that it will still take a number of years to exit the ISPS blacklist.

Rails

The railways of Cameroon perform relatively well by African standards, with good productivity indicators. Cameroon implemented one of the earliest rail concessions in the region—CAMRAIL. The concession arrangement has helped to boost operational efficiency and thus traffic, so that labor and rolling stock productivity measures show substantially better performance than the region's major publicly owned railways and compare favorably with other rail concessions in the region (table 6). CAMRAIL carries about 60 percent of nonmineral traffic from Douala to the borders with the Central African Republic and Chad, and it compares favorably with competing bus services on the route from Yaoundé to Ngaoundéré, for which travel by unpaved road becomes difficult in the rainy season.

Table 6. Comparative performance of Central African railways, 2005

	Labor productivity	Carriage productivity	Locomotive productivity	Wagon productivity	Freight yield	Passenger yield
Angola, CFM	580	4,045	30	950		
Cameroon, CAMRAIL	603	4,738	26	868	5	2
Congo, Dem. Rep., CFMK	18	64	10	257	14	4
Congo, Dem. Rep., SNCC	38	275	4	317	13	3
Congo, Rep., CFCO	221	3,212	27	300	11	6
Gabon, SETRAG	1,778	1,891	39	902		
Rail concessions	350	2,945	23	491	5	2

Source: AICD railways database.

Legend: Labor productivity = '000s traffic units per employee; Locomotive productivity = millions of traffic units per locomotive; Carriage productivity = '000s passenger-kilometers per carriage; Wagon productivity = '000s net tonne-kilometers per wagon.

Since 2007 the concessionaire's productivity has improved. The share of working locomotives increased from 76.9 in 2007 to 83.4 percent in 2010. CAMRAIL's debt service coverage ratio rose from

1.4 in 2007 to 2 in 2010. The ratio of staff costs to traffic revenues dropped from 27.6 percent in 2007 to 25.7 in 2010. In 2010, CAMRAIL's sales increased by 5 percent (World Bank 2011c).

CAMRAIL is one of the more intensively used networks in Sub-Saharan Africa, at 1.1 million traffic units per route-km, compared to others in the region, which serve well under one million traffic units per year (figure 10). Nevertheless, CAMRAIL's traffic density is lower than the average for West Africa, and only a fraction of that found in southern Africa and North Africa. By global standards, these kinds of traffic volumes are little more than what might be carried by a moderately busy branch line. Moreover, such low traffic volumes do not generate the revenue needed to finance track rehabilitation and upgrading.

Challenges

In spite of relatively good performance, CAMRAIL activities are affected by obsolete rolling stock and deteriorated infrastructure. Because of these supply constraints, CAMRAIL cannot adequately respond to the growing demand for passenger and freight transport. But plans to acquire 38 new passenger cars and rehabilitate 175 km of the most-deteriorated track sections of the 1,104 km-long railway line between Douala and Ngaoundéré are being implemented (World Bank 2011c). These projects will allow CAMRAIL to expand and meet increasing demand.

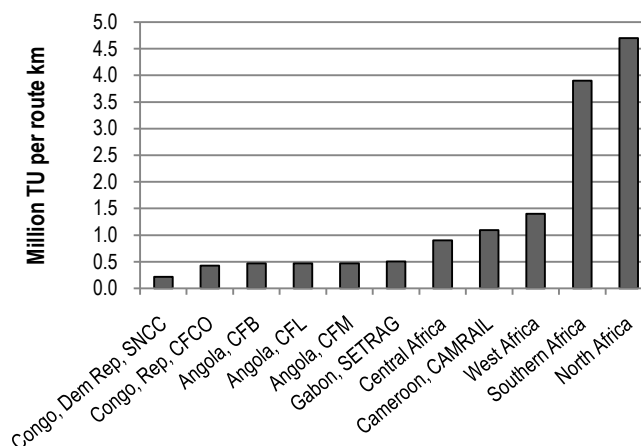
More broadly, the Government is working on a long-term master plan for the development on the railway sector. The required investments are likely to be high, and until they can be fully funded a logical first step will be optimize the operation of the existing concession. If some of the large-scale mining projects under consideration were to materialize, further rail development may be warranted to connect mining sites with ports. However, this is contingent on a careful analysis of demand.

Air transport

Achievements

Cameroon is a natural air-traffic hub for Central Africa, as demonstrated by relatively high traffic levels. With close to a million total seats, Cameroon's traffic was higher than that of the Central African Republic, Gabon, Chad, and Congo, but well below that of Nigeria. After Nigeria, Cameroon had the second-highest number of international and intercontinental seats (table 7).

Figure 10. Traffic densities on African railways



Source: AICD 2010b.

Note: Density is normally expressed as traffic units per route-km. The traffic units carried by a railway are the sum of the passenger-km and the net tones-km.

TU = traffic units.

Table 7. Benchmarking of Cameroon's air transport indicators

Country	Cameroon	Central African Rep.	Gabon	Chad	Nigeria	Congo, Rep. of
Total	975,865	44,503	769,912	197,682	13,116,015	913,478
Domestic seats (seats per year)	105,742	N/A	374,400	N/A	9,304,568	443,634
Seats for international travel within Africa (seats per year)	472,089	20,661	272,792	109,074	1,373,745	351,882
Seats for intercontinental travel (seats per year)	398,034	23,842	122,720	88,608	2,437,702	117,962
Seats available per capita	0.05	0.01	0.59	0.018	0.089	0.24
Herfindahl-Hirschmann Index—air transport market (%)	10	50	39	36	11	31
Percent of seat km in newer aircraft	92	100	98	100	71	73
Percent of seat km in medium or smaller aircraft	32	24	28	94	28	51
Percent of carriers passing IATA/IOSA Audit	0	0	0	0	28.6	0
FAA/IOSA Audit Status (as of February 2011)	No audit	No audit	No audit	No audit	Passed	No audit

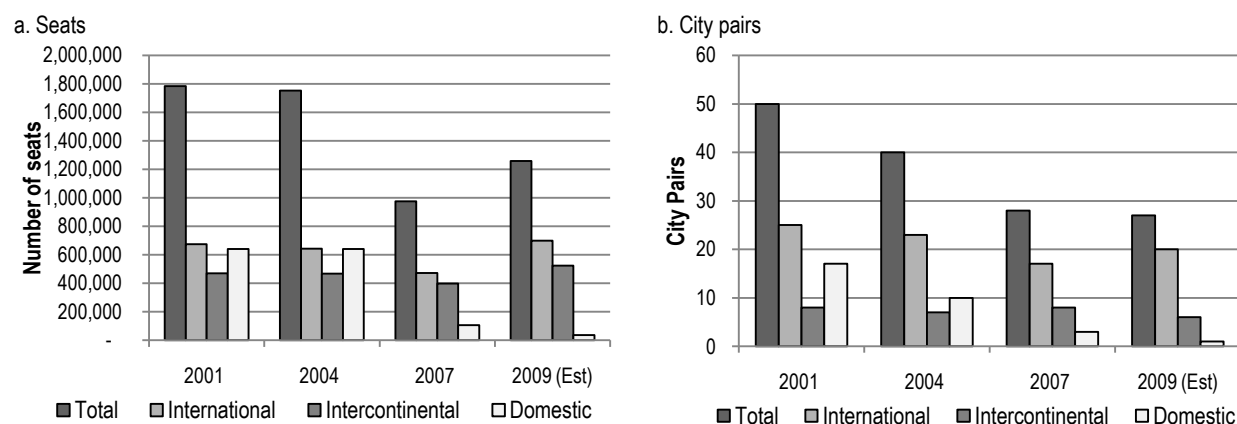
Source: Bofinger 2009. All data as of 2007 based on estimations and computations of scheduled advertised seats, as published by the Diio SRS Analyzer. This captures 98 percent of worldwide traffic, but a higher percentage of African traffic is not captured by the data.

Note: FAA = U.S. Federal Aviation Administration; IASA = International Aviation Safety Assessment; IATA = International Air Transport Association; IOSA = IATA International Safety Audit.

— = Data not available.

After years of decline, Cameroon's air traffic and connectivity are recovering from the air transport market collapse. Between 2001 and 2007 the number of total seats declined from 1,784,023 to 975,865. In 2009 the total number of seats grew to 1,259,276 seats, an expansion of 30 percent over 2007. In particular, the number of international seats grew by about 50 percent between 2007 and 2009, from 472,089 to 698,360 (figure 11a).

International connectivity is recovering. Between 2001 and 2007 international city pairs served dropped from 25 to 17. Preliminary numbers show that in 2009 city pairs were 20, showing a slightly recover in the number of international city pairs (figure 11b).

Figure 11. Evolution of seats and city pairs in Cameroon

Source: Bofinger 2009. Derived from AICD national database downloadable from <http://www.infrastructureafrica.org/aicd/tools/data>

Note: As reported to international reservation systems.

Cameroon's air market is more competitive than that of other countries in the region. The Herfindahl-Hirschmann Index (HHI), a commonly accepted measure of market concentration,⁷ shows that Cameroon has the lowest concentration of services among its neighbors, with the measurement taken before the collapse of Cameroon Airlines. The collapse of Cameroon Airlines was followed by a significant increase in capacity by Royal Air Maroc and Ethiopian airlines, indicative of a more liberalized environment.

Cameroon is one of the few African countries that has managed to attract private sector participation in its air transport infrastructure. Between 1993 and 2008, 7 of Cameroon's 14 airports were included in a 15-year joint-management contract involving shared risk between the public and private sector. The contract was co-managed by Aéroports de Paris (34 percent) and the government of Cameroon (24 percent), and other carriers (42 percent).

Challenges

In spite of the general traffic turnaround, the domestic market has yet to recover. The domestic market was the most impacted by the collapse of the air market: the number of domestic seats dropped from 640,620 in 2001 to 105,742 in 2007, a decline of 80 percent. In 2008 Cameroon's domestic capacity nearly collapsed with the demise of Cameroon Airlines. In 2009 the number of domestic seats further declined by 66 percent from 2007 levels, dropping to 36,480 seats (figure 11a). Similarly, the number of domestic city pairs dropped from 17 in 2001 to 10 in 2007 and 1 in 2009 (figure 11b).

Safety oversight needs strengthening. In September 2005 Cameroon Airlines was blocked from entering France until significant improvements in operations could be demonstrated. The ban was eventually lifted. But the 2005 safety audit of the International Civil Aviation Organization showed significant room for improvement. As part of a regional West and Central African project, Cameroon is now working on improving its safety oversight.

Water resources

Cameroon is well endowed with fresh water. In the south, the principal rivers—the Wouri, Sanaga, Nyong, and Ntem—flow southwestward or westward directly into the Gulf of Guinea. The Dja and Kadeï rivers drain southeastward into the Congo River. In northern Cameroon, the Benoué (Benue) runs north and west, eventually into the Niger, and the Logone flows northward into Lake Chad, which Cameroon shares with Chad, Nigeria, and Niger. The renewable water resource per capita is estimated at about 17,520 cubic meters per year, more than twice as much the Sub-Saharan African average of 7,000 cubic meters per year. Rainfall averages 1,604 mm per year, but levels vary across regions and over the course of the year.

Several factors exert pressure on water resources. Agricultural production represents 74 percent of total water use—with rice, in particular, accounting for heavy demand. Household use represents 18 percent of total water use and has increased over time, but access to clean water remains a major challenge for the population, as inconsistent and poor policies, combined with weak sector governance in

⁷The index is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. An HHI of 100 indicates the market is a monopoly; the lower the HHI, the more diluted the market power exerted by a single company or agent.

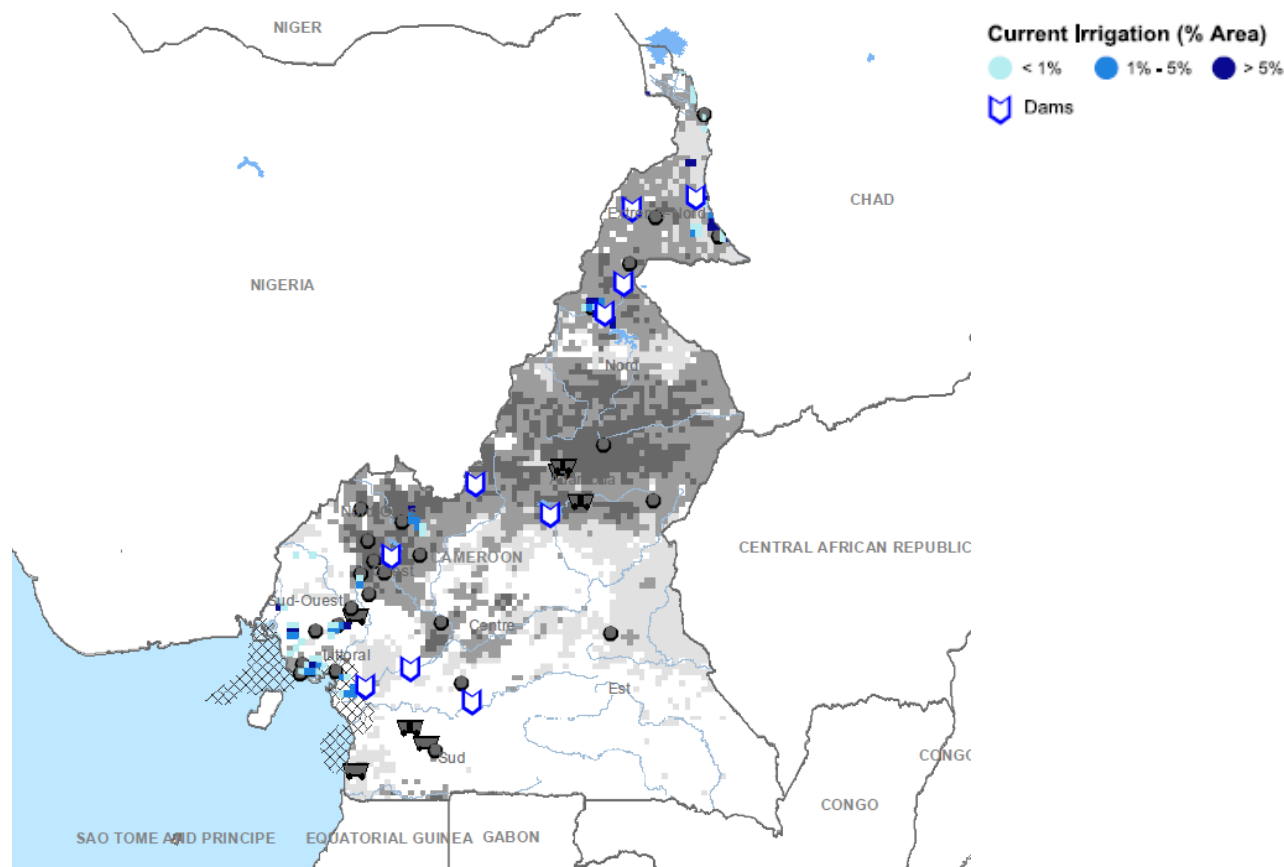
the last two decades, have limited the development the water supply and sanitation sectors (World Bank 2007). The industrial sector—accounting for 8 percent of the total water use—is growing as the economy surges.

Irrigation

Irrigation potential in Cameroon is substantial. Only 22,450 hectares out of a physical potential of 290,000 hectares are presently irrigated (figure 12).

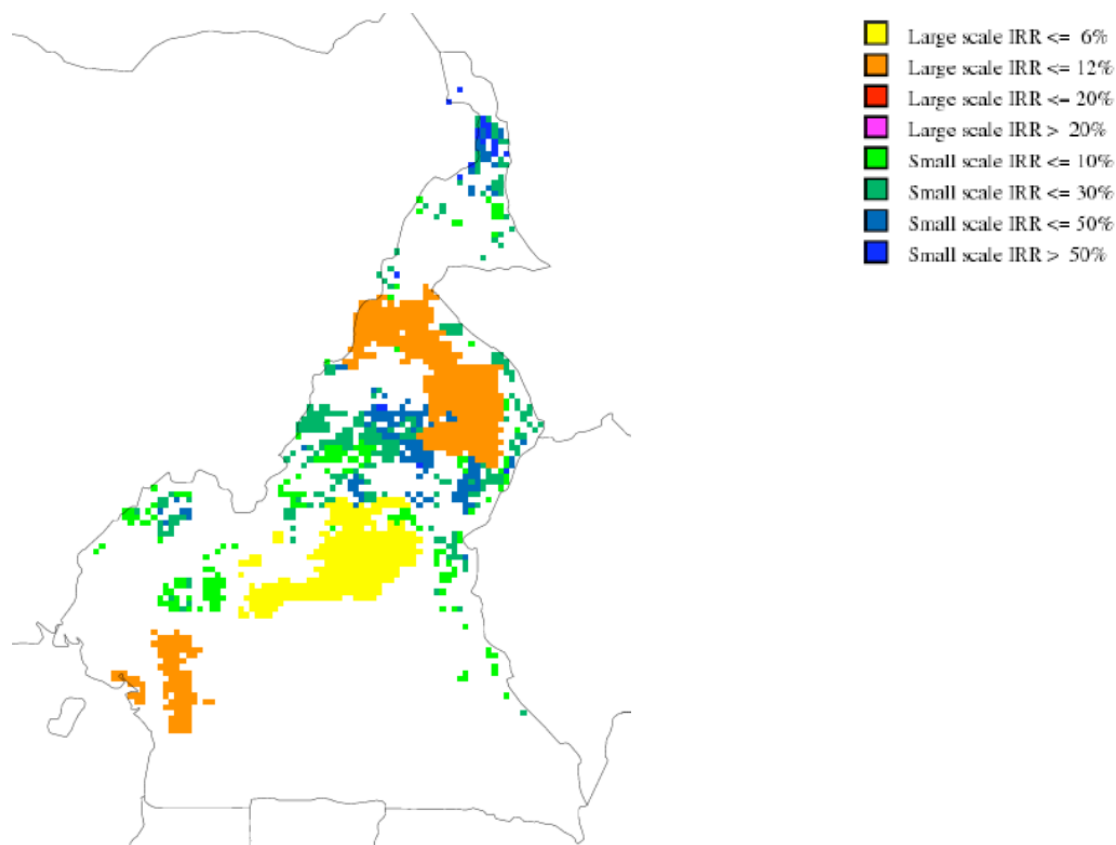
The irrigated area could be increased substantially with good economic returns. Simulations suggest that taking a threshold internal rate of return of 6 percent it is already economically viable to develop 518,176 hectares of land for irrigation through large- and small-scale projects, with the former representing 55 percent of the total. Water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agro-ecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed. The unit cost for large scale projects is set at \$3,000/hectare and for small scale projects at \$2,000/hectare.

Figure 12. Cameroon's current irrigation area



If the threshold internal rate of return were raised to 12 percent, the area economically viable for irrigation would shrink to 170,463 hectares, and only small-scale projects would remain viable. Large-scale projects seem not to be economically viable in Cameroon for a IRR of more than 12 percent. The investment required to attain this expansion (with 12 percent IRR) is \$881 million, with an acceptable IRR of 40 percent (table 8). This area with irrigation potential is concentrated in the central and northern parts of the country (figure 13). Regionally, Cameroon is, after Chad, the country with the greatest potential for small-scale irrigation projects at a rate of return comparable with regional peers (figure 14).

Figure 13. Cameroon's irrigation potential (baseline scenario)



Source: Map on current area: AICD Interactive Infrastructure Atlas for Cameroon downloadable from <http://www.infrastructureafrica.org>.

Map on irrigation potential: You and others(2009: appendix 2).

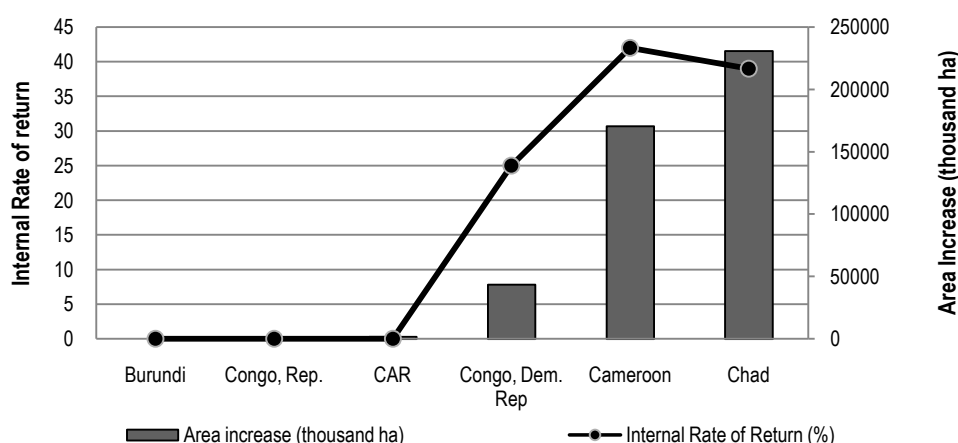
Note: The baseline scenario was calculated assuming investment cost of \$3,000 per hectare, a canal maintenance and water-delivery cost of \$0.01 per cubic meter, on-farm annual operation and maintenance costs of \$30 per hectare, and a discount rate of 12 percent.

Table 8. Cameroon's irrigation potential

Cutoff (%)	Large-scale			Small-scale			Total		
	Investment	IRR	Area increase	Investment	IRR	Area increase	Investment	IRR	Area increase
	\$millions	%	hectares	\$millions	%	hectares	\$millions	%	hectares
0	986	5.4	505,124	1538	29.0	297,633	2524	14	802,757
6	557	6.9	285,461	1203	34.0	232,715	1760	19	518,176
12	0	0.0	0	881	42.0	170,463	881	42	170,463
24	0	0.0	0	553	59.0	106,978	553	59	106,978

Source: You and others 2009.

Note: Water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agro-ecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed. The unit cost for large scale projects is set at USD3000/ha and for small scale projects at USD2000/ha.

Figure 14. Small-scale irrigation potential

Source: You and others 2009.

Note: Based on 12% cutoff estimates, at which the estimated area increase for Central African countries not included in the figures is zero. Water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agro-ecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed.

Water supply and sanitation

Achievements

Cameroon has reduced its reliance on surface water due to the rapid expansion of wells and boreholes. Reliance on surface water dropped from 37 percent of the population in 1991 to 32 percent in 1998 and to 9 percent in 2006 (table 9). Between 1998 and 2006 about 2.2 percent of the population shifted from using surface water to some other form of supply (figure 15a). In rural areas, 3.8 percent of the population moved up the water supply ladder from surface water, in particular by gaining access to wells and boreholes. At the national level, the use of wells and boreholes increased from 23 to 47 percent

between 1998 and 2006, a level comparable with the average in resource-rich countries. However, high and increasing reliance on wells and boreholes does not always guarantee safe water quality, as many wells and boreholes are unprotected and, hence, do not provide safe water.

Table 9. Cameroon's water and sanitation indicators benchmarked

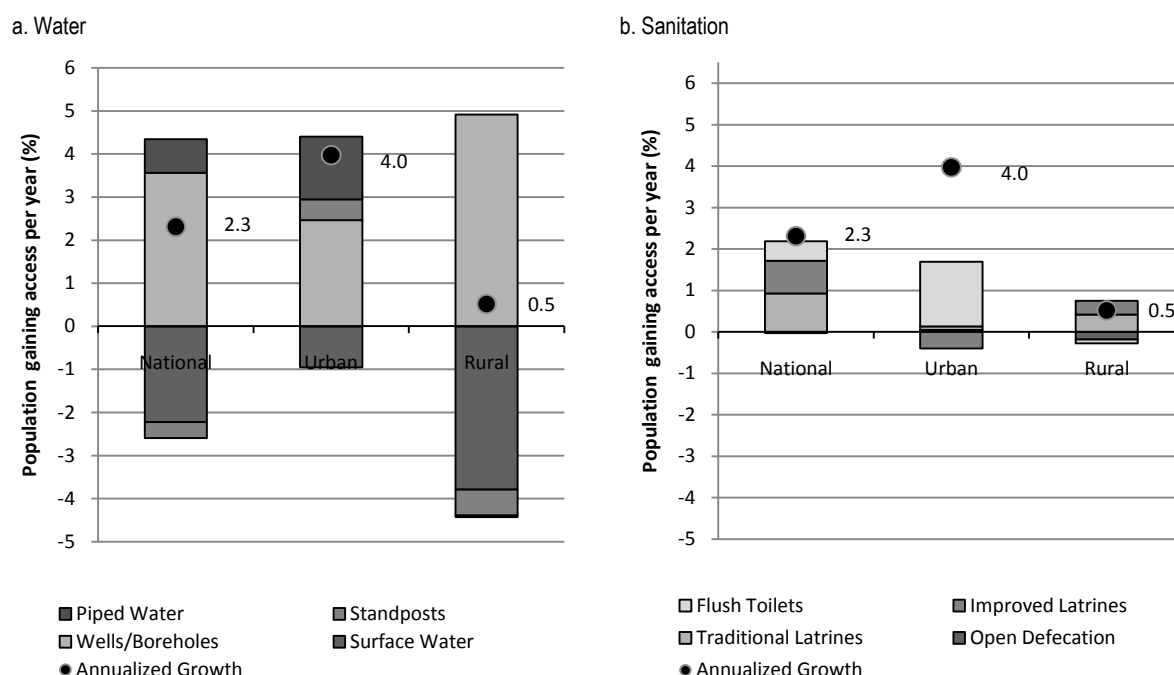
		Resource-rich countries	Cameroon			Middle-income countries
Unit		2005	1991	1998	2006	2005
Access to piped water	% pop	13	13	17	20	61
Access to stand posts	% pop	12	24	31	23	22
Access to wells/boreholes	% pop	47	27	23	47	5
Access to surface water	% pop	27	37	32	9	11
Access to septic tanks	% pop	13	6	9	12	48
Access to improved latrines	% pop	37	53	48	46	34
Access to traditional latrines	% pop	22	27	33	35	7
Open defecation	% pop	28	14	9	7	11
2005						
Domestic water consumption	liter/capita/day	115		—		196
Revenue collection	% sales	60		—		99
Distribution losses	% production	40		37		29
Cost recovery	% total costs	67		56		86
Operating cost recovery	% operating costs	94		79		121
Labor productivity	connections per employee	96		—		203
		Cameroon (2009)	Countries with non-scarce water resources		Other developing regions	
Average effective tariff	US\$ per m3		0.8		0.6	0.03–0.6

Source: AICD water supply and sanitation database, downloadable from <http://www.infrastructureafrica.org/aicd/tools/data>.

Note: Access figures from Demographic and Health Surveys (1991 and 1998) and Multiple Indicators Cluster Survey (2006) as reported by WHO 2010a and 2010b. A country is considered to have non-scarce water resources if renewable internal freshwater resources per capita are greater than 3,000 mm.

— = data not available.

Open defecation has also declined, if slowly, with the expansion of traditional latrines (figure 15b). The practice declined from 9 percent to 7 percent between 1998 and 2006, both figures being only about a quarter of the typical level of open defecation in resource-rich countries (table 9). Over this period, use of traditional latrines increased from 33 percent of the population in 1998 to 35 percent in 2006. But because the overall level of access to improved sanitation in 2006 remained just 47 percent, the country was far behind the goal of achieving the Millennium Development Goal of 74 percent of population with access to improved sanitation (AMCOW 2010b).

Figure 15. Annual gain in access each year to various modes of water supply and sanitation, 1998–2006

Source: WHO 2010a and 2010b, from the 1998 Demographic and Health Survey and 2006 Multiple Indicators Cluster Survey.

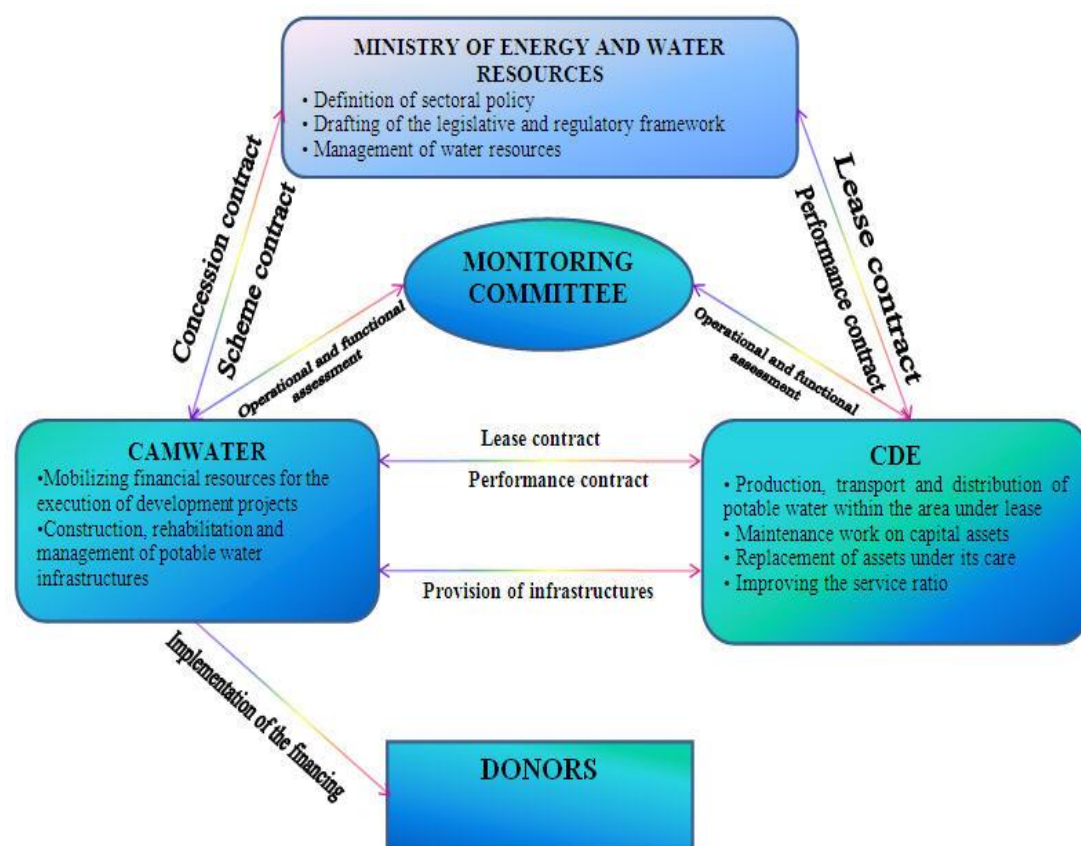
Cameroon has made significant institutional reforms affecting urban water supply. By the end of the 1990s the operational and financial performance of the national urban water utility, SNEC,⁸ had become problematic (World Bank 2007a). Facing unreliable services, commercial and industrial users started to develop their own alternatives. In October 2005, the government created a public holding company (CAMWATER⁹) to plan sector development and investments (such as construction, rehabilitation, and management of potable water infrastructures). In addition, the government signed a 10-year *affermage* contract with CDE¹⁰ commencing in May 2008 for the production, transport, and distribution of water in 106 urban and peri-urban centers (figure 16).

⁸ Société Nationale des Eaux du Cameroun.

⁹ Cameroon Water Utilities Corporation.

¹⁰ Camerounaise des Eaux.

Figure 16. Actors in the water supply sector in Cameroon



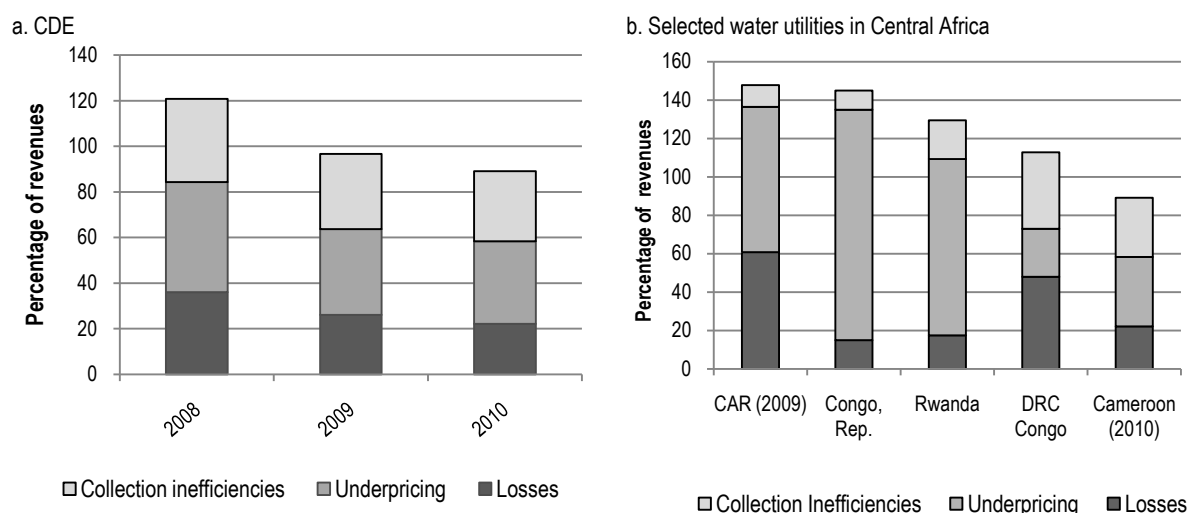
Source: CDE 2011.

In CDE's first years of operation significant efficiency improvements were achieved by reining in hidden costs (defined in box 1). Between 2008 and 2010 non-revenue water drop from 41 to 34 percent of the production and collection ratio increased from 59 to 66 percent of the billings, with the cost recovery ratio increased from 1 to 1.2. These improvements reduced hidden costs from 121 to 81 percent of revenues between 2008 and 2010, below the level of other countries in the region (figure 17).

Box 1. Hidden costs in utilities

A monetary value can be attributed to observable operational inefficiencies—mispricing, unaccounted-for losses, and undercollection of bills, to mention three of the most conspicuous—by using the opportunity costs of operational inefficiencies, that is, tariffs for uncollected bills and production costs for mispricing and unaccounted-for losses. These costs are considered hidden since they are not explicitly captured by the financial flows of the operator. Hidden costs are calculated by comparing a specific inefficiency against the value of that operational parameter in a well-functioning utility (or the respective engineering norm), and multiplying the difference by the opportunity costs of the operational inefficiency.

Source: Briceño-Garmendia, Smits, and Foster 2009.

Figure 17. Hidden costs of water supply utilities in Cameroon and Central Africa countries

Source: Derived from Briceño-Garmendia and others 2009.

DRC = Democratic Republic of Congo; CAR = Central African Republic.

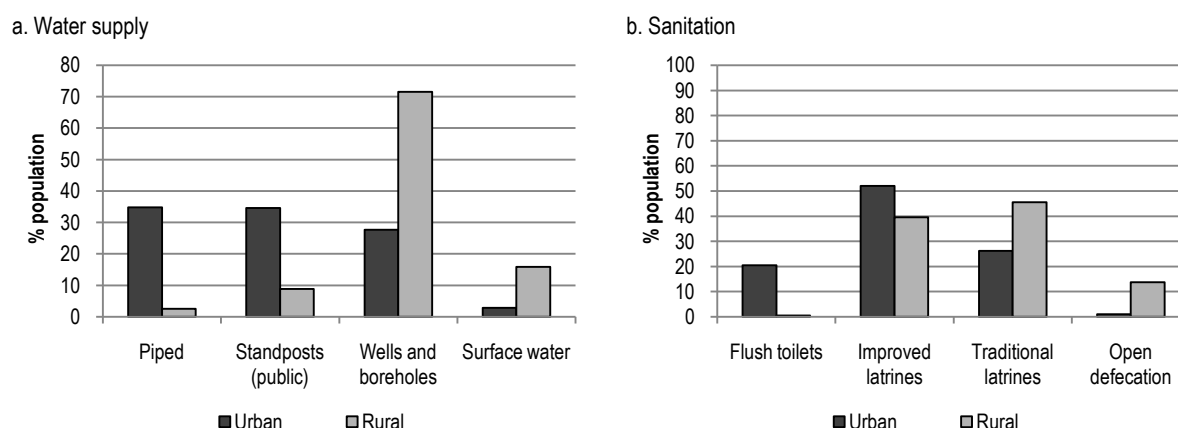
Challenges

The institutional setup for the provision of water supply and sanitation services in Cameroon needs to be completed and clarified. Cameroon has made efforts to decentralize the provision of services but so far has failed to implement the policy. The inability of local authorities to manage water and sanitation services as stated in the laws on decentralization is noticeable (Global Water Partnership 2010). The sanitation sector is very poorly organized, lacking goals, a specific strategy, and a dedicated institutional body (AMCOW 2010b).

There is a wide disparity between rural and urban populations in access to sources of drinking water. At 69 percent of the population, urban access to household piped water and public stand posts is 6 times higher than rural access; at 28 percent, urban reliance on wells and boreholes is one-third of the level in rural areas (figure 18a). As of 2006, 72 percent of the rural population got their water from boreholes equipped with hand pumps, compared with 34 percent on 1998.

Sewerage is virtually nonexistent in Cameroon, and no major investment has been made in recent years. A tiny 5 km sewerage network in Douala dates from before independence and is no longer operational. Since then, SIC¹¹ —a public real estate development agency—has built some small sewer systems as part of housing construction projects for civil servants. In theory the SIC systems serve 60,000 people (or 0.6 percent of the urban population), but in practice many of the systems are no longer functioning. Some small-scale pilot projects have recently been initiated. The private sector has invested in approximately 70 sludge collectors in Douala and Yaoundé, and donors have financed small condominial systems in Douala, Bertoua, and Edea, and as part of the Community-Led Total Sanitation campaign in selected rural areas (World Bank 2011d).

¹¹Société Immobilière du Cameroun.

Figure 18. Urban versus rural access to water supply and sanitation, 2006

Source: AICD water supply and sanitation utilities database downloadable from <http://www.infrastructureafrica.org/aicd/tools/data>. Access figures calculated by AICD using data the 2006 Multiple Indicators Cluster Surveys published by WHO 2010a and 2010b

The effects of low investment in the water supply and sanitation sectors are compounded by low budget-execution ratios. The discrepancy between the budget cycle and the cycle of projects makes it hard for the Ministry of Energy and Water Resources to spend up to 50 percent of its investment budget each year. As of 2010 a trust fund set up to finance sustainable development projects in the water and sanitation sector was not operating (Global Water Partnership 2010).

Power

Achievements

Access to power has steadily improved in Cameroon. National access to electricity increased from 37 percent in 1996 to 46 percent in 2002, and to 48 percent in 2007 (Helio International 2009; World Bank and IFC 2010), above the average for Africa's resource-rich countries (table 10). Estimates of urban access suggest that between 65 percent and 88 percent of the urban population has access to electricity (USAID 2010; Nkama 2007). At 88 percent, access to power in urban areas is greater than in most low-, middle-, and resource-rich countries in Africa. But these positive trends do not extend to rural areas: only about 14 percent of rural dwellers benefit from access to electricity, half the level in comparable countries.

Several regulatory measures have been adopted to attract private sector participation in the power sector. In 1998, the government initiated a series of reforms to develop the sector. In 2000 a sector regulator (ARSEL) and a rural electrification agency were established. The reforms provided for private sector participation in transmission, generation, and distribution. In 2001, the state-owned, vertically integrated utility was privatized, becoming AES Sonel, and granted a monopoly over transmission and distribution in the concession area, as well as the right to own up to 1,000 MW of installed generation capacity. In 2006 the Electricity Development Corporation (EDC) was established as an asset holder; EDC currently supports the preparations for the Lom Pangar Hydropower project. In 2009 a rural energy fund was created to establish a transparent and private sector-based approach to rural energy.

The privatization of AES Sonei has led to growing power connections, reductions in unserved energy demand, and increasing investment, particularly in generation infrastructure. Since 2001 AES Sonei has connected some 160,000 customers and invested more than \$300 million in generation capacity and rehabilitation of the network. Unserved energy decreased from 2 percent in 2003 to 0.5 percent in 2008. Privatization has also leveraged \$360 million in private funds for a five-year investment program focused on rehabilitation of existing hydropower stations and transmission networks. Also, since privatization, the generation capacity of AES Sonei has been expanded. AES Sonei built two new plants powered by heavy fuel oil: Dibamba, an 88 MW emergency power plant near Douala, and Limbe with 85 MW. In addition, in 2006 AES Sonei collected about 94 percent of its bills, above the average for resource-rich countries (at 70 percent, table 10).

The investments in generation infrastructure have put Cameroon's per capita generation capacity above the level of peer countries. The recent additions to generation assets, in the form of the thermal power plants at Limbe and Dibamba, have helped boost per capita capacity. Cameroon has 58 MW of installed capacity per million people, compared with just 43 MW per million for the resource rich countries as a whole.

Table 10. Cameroon's power indicators benchmarked

Indicator	Unit	Cameroon	Middle-income countries	Resource-rich countries
National access to electricity	% of population	48	50	46
Urban access to electricity	% of population	88	85	79
Rural access to electricity	% of population	14	33	28
Installed generation capacity	MW	1,105	36,971	4,105
Installed generation capacity per million	MW per million people	58	799	43
Firms that find power a constraint for business	% firms	67*	31	56
Firms with own generator	% firms	51	18	63
Outages, number, annually	number per year	128	71	174
Outages, value lost, annually	% sales	5	2	7
Collection rate, reported by utility	% billing	94	91	70
Cost recovery ratio, historical	%	60	85	97
Revenue per unit	US cents per kWh	12	13	13
System losses	% generation	35	20	52
Total hidden costs	% revenue	135	0	168
		Cameroon	Countries with predominantly hydro generation	Other developing regions
Residential tariff (at 75 kWh)	US cents per kWh	0.10	10.27	
Commercial tariff at 900 kWh	US cents per kWh		11.73	5–10
Industrial tariff (at 50,000 kWh)	US cents per kWh	0.03	11.39	

Source: Eberhard and others 2009.

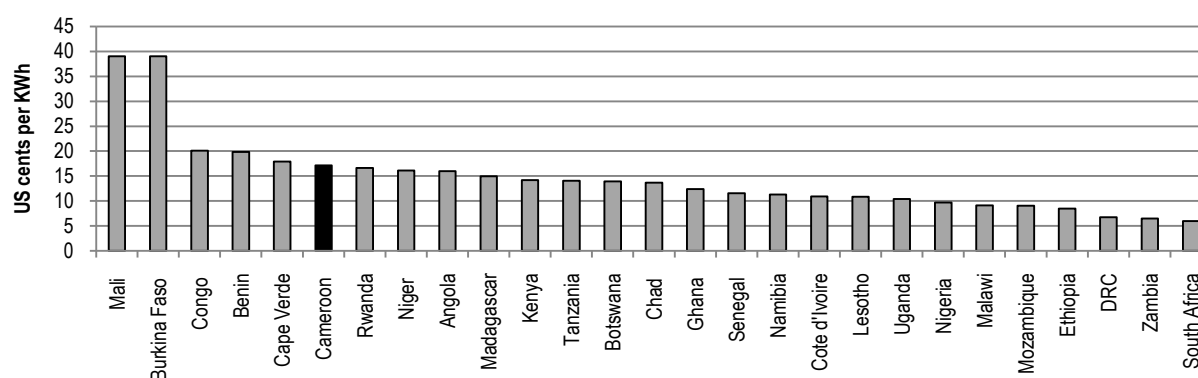
Note: Cameroon data are for 2005 unless indicated otherwise. Constraint to business activity based on the manufacturing sector. Industrial tariffs represent prices paid for ALUCAM, the large aluminum smelter.

Further investment will help Cameroon diversify its energy portfolio and enhance the availability of reliable power in the country. At present, 70 to 80 percent of Cameroon's power is derived from hydropower sources, with the remainder from conventional thermal. Cameroon's first independent power producing agreement (IPP) will add 216 MW in power generation and trigger the development of Cameroon's gas reserves, as yet unexploited. Also, Cameroon will further increase its generation capacity when the new Lom Pangar plant becomes fully operational.

Challenges

In spite of recent increases in generation capacity, power generation continues to be expensive in Cameroon. At \$0.17 per kilowatt-hour, power costs in Cameroon, are among the highest in Africa, inviting comparison with costs from small-scale thermal systems (figure 19). Two factors explain the high costs. First, hydropower resources are seasonal and subject to fluctuation. Second, prices are high for the diesel on which the country relies for back-up generation in the dry season (figure 20). Despite Cameroon's oil resources, the country lacks a refinery, and prices reflect that lack. The costs of transporting oil along Central Africa's corridors are high (\$0.13 per tonne-kilometer).

Figure 19. Costs of power production in Sub-Saharan Africa

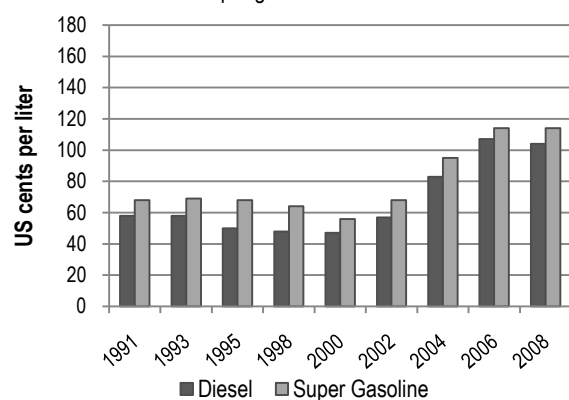


Source: Briceño-Garmendia and Shkaratan 2010.

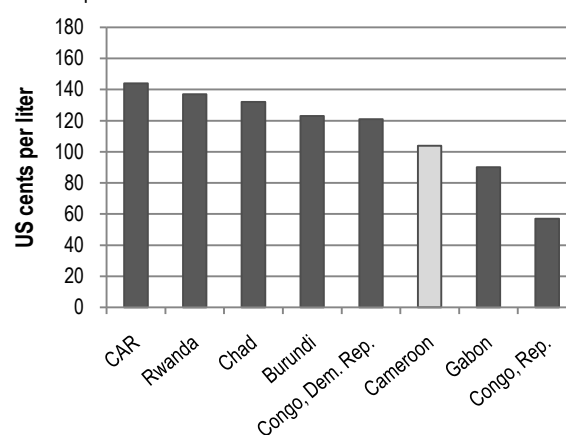
The average power tariff in Cameroon, at \$0.10 per kilowatt-hour, fails to recover production costs. Whereas tariffs are in the middle of the price distribution in Sub-Saharan Africa (figure 21), they mask generous cross-subsidies to the aluminum smelter, Alucam. The low- and medium-voltage consumer paid between \$0.11 and \$0.14 cents in 2009, whereas Alucam benefitted from a tariff cap of 7 CFA francs per kilowatt-hour (less than \$0.02) up to 2009, until recent revisions took effect (Husband, McMahon, and van der Veen 2009) (box 2).

Figure 20. Diesel and super gasoline retail prices

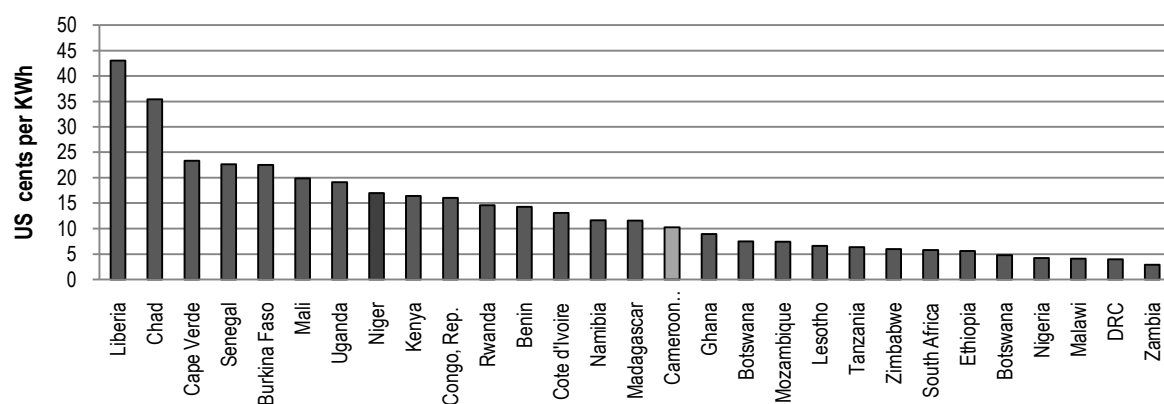
a. Prices of diesel and super gasoline in Cameroon



b. Retail price of diesel in Central Africa



Source: GTZ 2009. Diesel retail prices as of mid-November 2008 from GTZ Survey carried out November 15–17, 2008.

Figure 21. Power prices in Sub-Saharan Africa

Source: Derived from Briceño-Garmendia, and Shkaratan 2010.

Box 2. Electricity subsidies for aluminum in Cameroon

Alucam is Cameroon's largest electricity consumer accounting for 35–40 percent of the power produced. Under a historic 30-year agreement that ended in 2009, Alucam benefitted from extraordinarily low prices for electricity and a guaranteed supply of power. Alucam was guaranteed 145 MW of power during the dry season and 165 MW during the rainy season. A tariff cap of 7 CFA francs per kWh (around \$0.017) until the end of 2009, compared to tariffs of \$0.114/kWh and \$0.136/kWh for medium- and low-voltage customers, respectively. These prices were exceedingly low in the context of chronic power problems throughout the country. Alucam has been seen as receiving an implicit power subsidy for decades. The overall subsidies can be estimated to be around \$120 million per year, equivalent to 32 percent of AES Sonel's revenue. Since the expiration of the agreement, power prices have been increased by 73 percent to 12.94 CFA francs, or \$0.031 per kWh. These prices are above the global electricity tariffs for aluminum companies, which average around US cents 2.56 per kWh. Even with the price increase, they still fall well below the operating costs of power generation at US cents 13 per kWh and the total cost of US cents 17 per kWh, adding to the cost recovery woes of AES Sonel.

Source: Husband, McMahon, and van der Veen 2009, World Bank, 2011b.

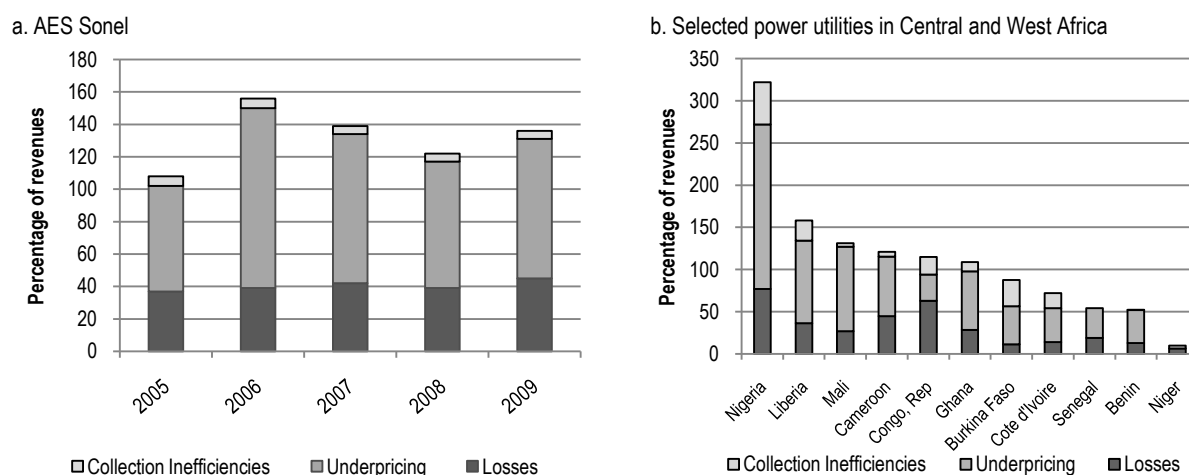
High costs and subsidized tariffs, compounded by weak operational performance, affect the financial sustainability of AES Sonel. Tariffs have historically recovered only 60 percent of the costs, significantly below cost-recovery levels in Africa's middle-and resource-rich countries (table 10). AES Sonel loses approximately \$0.07 per kilowatt-hour sold. Due to the prevalence of theft, transmission and distribution losses have historically been high, at 35 percent, above the level observed in comparable countries. In fact, nontechnical losses increased from 22 percent in 2006 to 26 percent in 2008. Burgeoning illegal connections, decrepit metering systems, and outmoded billing software have compounded the situation.

The burden of financial and operational inefficiencies has increased over time. Hidden costs rose from about 108 percent of revenues in 2005 to 121 percent in 2009. In 2009, system losses drained \$167 million from AES Sonel's revenues. In absolute terms, the largest contributor to the hidden costs was the mispricing of power, which resulted in losses of \$265 million in 2009 (table 11). Relative to several of Cameroon's West and Central African neighbors, the burden of hidden costs for AES Sonel is high (figure 22b).

Table 11. AES Sonel's hidden costs

	Power billings GWh/year	System losses %	Collection ratio %	Average operating cost \$/kWh	Average revenue \$/kWh	Average effective tariff \$/kWh	Total hidden costs \$/mill/year	Total hidden costs % revenues
2005	3,264	31	93.7	0.17	0.11	0.10	384	108
2006	3,374	28	93.7	0.17	0.09	0.08	435	151
2007	3,360	32	93.7	0.17	0.10	0.09	426	128
2008	3,512	33	93.7	0.17	0.11	0.10	409	105
2009	3,522	35	93.7	0.17	0.11	0.10	454	121

Source: Briceño-Garmendia, Smits, and Foster 2009; World Bank 2008 and 2011b

Figure 22. Hidden costs in power generation in Cameroon and comparator countries

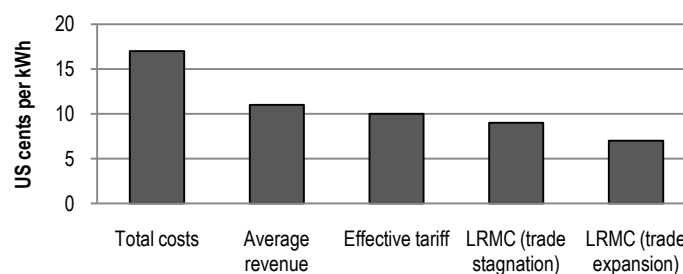
Source: Briceño-Garmendia, Smits, and Foster 2009.

The power supply in Cameroon is unreliable. Investment climate surveys suggest that firms encountered around 128 outages in 2009, almost as twice the average for Africa's middle-income countries, enduring blackouts of four hours each time. On average, at least 16 days a year are spent without power due to outages (World Bank 2009c). To combat erratic power supply, many firms generate their own power. It is estimated that as much as 31 percent of the country's installed capacity is self-generation. Suppressed demand for power is around 241 GWh and is expected to progressively increase with growing domestic demand (World Bank and IFC 2010).

Investment climate surveys from 2007 determined that unreliable power was one of the top five constraints to business activity. Around 67 percent of firms reported that power was a major constraint to business, similar to other fragile states but worse than the averages for Africa's low- and middle-income countries and resource-rich countries.

Firms that generate their own power face high costs. Self-generation is estimated to cost the private sector \$0.46 per kilowatt-hour, four times the tariff charged by the power utility, which pushes up the prices of the firms' products. If the price premium of running backup generators is included assuming that they run 10 percent of the time, firms pay a markup of around \$0.04 per kilowatt-hour to power costs.

Looking ahead, simulations suggest that with development of regional trade, made possible by further development of Cameroon's hydropower resources, AES Sonel's long-run marginal costs could fall to \$0.07 per kilowatt-hour, less than half the current value, and would be better aligned with current tariffs levels (figure 23). The cost reductions would come from further development of

Figure 23. Long-run prospects for power in Cameroon

Source: Rosnes and Vennemo 2009; World Bank 2008

Note: LRMC = long-run marginal costs.

Cameroon's hydropower resources.

Cameroon has enormous potential within the Central African Power Pool (CAPP) to produce low-cost hydropower and become a major player in regional trade by exporting power to Chad, the Republic of Congo, Gabon, and Equatorial Guinea. To fully develop regional trade through the CAPP, however, Cameroon would need to develop 1,400 MW of hydropower over and above the amounts needed to meet domestic demand, and to develop an additional 831 MW in interconnector capacity. This would also result in commercial gain through exporting over half the domestic power production. A one-time investment of \$2.6 billion to develop additional hydropower potential and interconnectors in Cameroon would yield an annual return of 12 percent.

Information and communication technologies

Achievements

Mobile communications have been the main driver of ICT access in Cameroon, as in most African countries. Cameroon was an early introducer of mobile competition through the licensing of two operators, but the market has remained a duopoly. Mobile subscriptions per 100 people rose from fewer than one in 2000 to 34 by 2009, with 85 percent of the population now covered by a signal (table 12) (France Telecom 2010).

Table 12. Cameroon's ICT indicators benchmarked

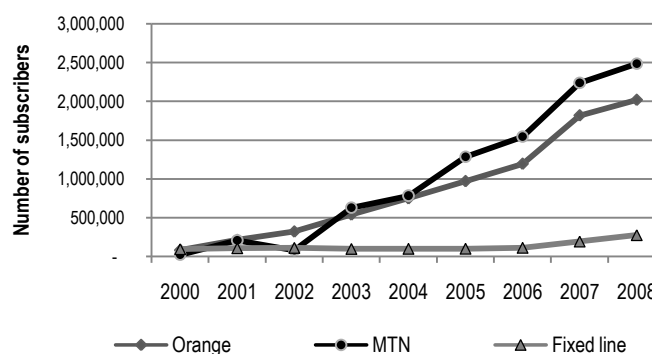
Indicator	Unit	Cameroon		Lower-middle income countries	Sub-Saharan Africa
		2000	2008/09	2008	2008
GSM coverage	% population under signal	30	85	77	56
Mobile phone	subscribers/100 people	0.6	34	47	33.3
International bandwidth	bits/capita	0.2	13	153	34
Internet	users/100 people	0.3	6	13.9	5.1
Landline	subscribers/100 people	0.6	2.2	13.6	1.5
		Cameroon		Lower-middle income countries	Sub-Saharan Africa
		2009	2008	2008	2008
Price of monthly mobile basket	US dollars	14.7	8.4	11.8	
Price of monthly fixed-line basket	US dollars	14.7	4.8	11.6	
Price of monthly fixed broadband	US dollars	104	31	100.1	
Price of a 1-minute call to US	US dollars	0.8	—	0.9	
Price of an inter-Africa call per minute	US dollars	0.9	—	1.0	

Source: AICD database.

— = data not available

As of 2008, Cameroon and the Democratic Republic of Congo were the top two leading markets for mobile telephony in Central Africa, with around 4.5 million subscribers in each country, followed by Chad with 1.1 million subscribers and Gabon with 1 million (figure 24). Since 2006 fixed-line penetration has grown rapidly with the expansion of limited-mobility portable phones offered by the incumbent operator, CAMTEL.¹² Such phones are a fixed-line solution that offers mobility of up to 40 kilometers and both mobile and fixed handsets. In 2008, two years after the launch, users of this technology increased from 28,000 to 150,000, surpassing the number of traditional fixed lines in the country (125,000). The number of landline subscriptions per 100 people grew from 0.6 in 2000 to 2.2 in 2009.

Figure 24. Expansion of mobile and land-line markets in Cameroon



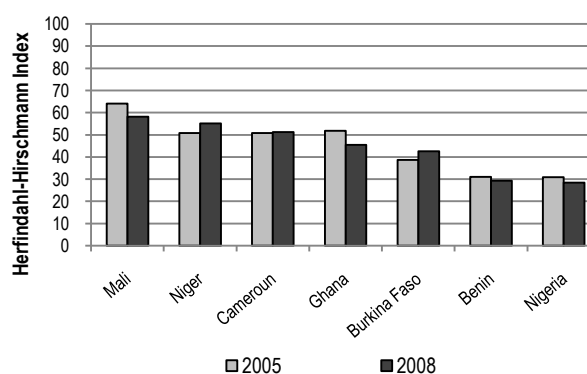
Source: Balancing Act 2008.

Note: In 2008, there were 125,000 fixed lined and 150,000 fixed/mobile lines.

Challenges

Cameroon has lagged in reforming its telecommunication sector. Even though the sector regulator, ART (Agence de Régulation des Télécommunications), was established by the Telecommunications Act in 1998, no further legislation has been enacted and the regulatory landscape remains unclear. The market is still not fully liberalized. South Africa's MTN and Orange of France dominate the mobile market, which is one of the highest in Cameroon's peer group, as measured by the Herfindahl-Hirschmann Index (figure 25).¹³ There are numerous Internet service providers, but the market is led by CAMNET, a CAMTEL subsidiary offering ADLS connections, and the two mobile operators.

Figure 25. Market concentration in Cameroon and selected African peers



Source: World Bank 2008

¹² Cameroon Telecommunications.

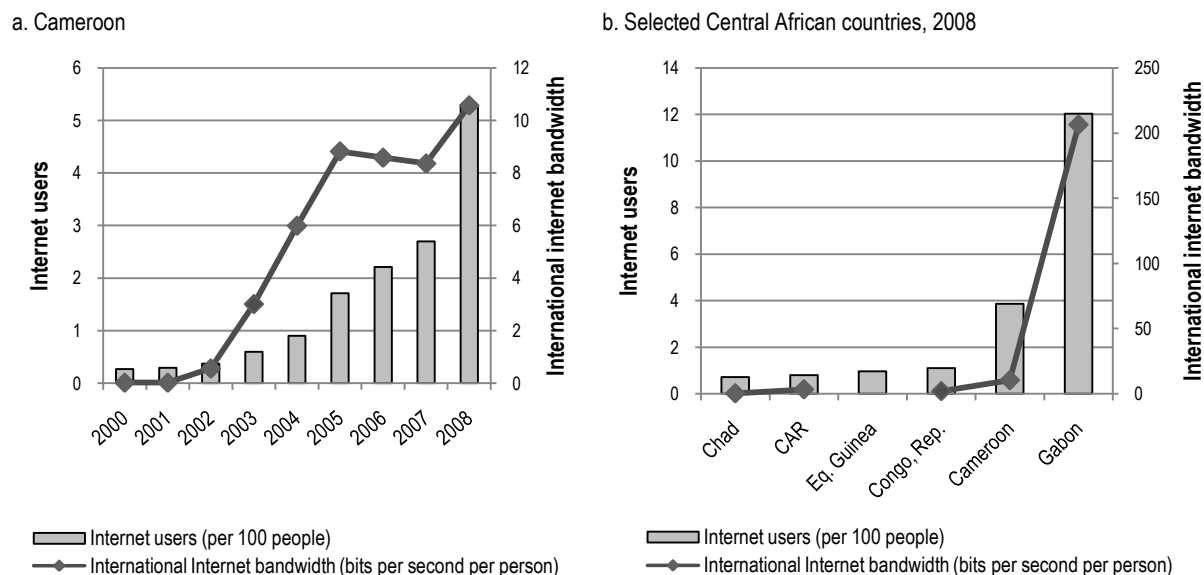
¹³ The Herfindahl-Hirschmann index (HHI) is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. An HHI of 100 indicates the market is a monopoly, while a lower the HHI the more diluted is the market power as exerted by one company/agent.

Restructuring and privatizing CAMTEL will yield significant fiscal benefits. CAMTEL has been the recipient of large indirect subsidies in infrastructure, highlighting the significant costs of the telecom sector to government. In most other African countries, the telecom sector is the first to be privatized and to operate without government support, as its sector fundamentals allow for cost recovery through commercial tariffs and a relatively short path to breaking even because of relatively low capital expenditures. The privatization of CAMTEL was launched in 1997, but the process stalled in 2002 after negotiations with the first two bidders failed.

The country has yet to benefit fully from its connection to the SAT3 undersea fiber-optic cables. Connection to SAT3 led to an increase in Internet connectivity from 0.2 to 13 bits per person between 2000 and 2009 (figure 26a), but that rate of connectivity is low in comparison to Sub-Saharan African peers (table 12, figure 26b).

The full benefit of the submarine cable connection has been mitigated by CAMTEL's monopoly over the gateway: Although prices are cheaper where there is access to submarine cable, they are even lower when there is a competitive international gateway. As a result, Internet service providers continue to rely on costly VSAT infrastructure. Although Cameroon's Internet and international call prices are level with the Sub-Saharan Africa average (table 12), ample room remains for lower prices (table 13). As an example, the launch of competitive wireless offerings by mobile operators forced down fixed broadband prices from \$104 in 2009 to \$61 in 2010.

Figure 26. The Internet market in Cameroon and elsewhere in Central Africa



Source: AICD database.

Further competition would boost broadband development. As of 2009, there were only about 8,000 fixed broadband subscriptions in the Cameroon. Mobile operators have been slow to launch high-speed mobile wireless networks and instead have deployed fixed wireless solutions using WiMAX technology. Two additional undersea cables now underway should bolster competition and lower wholesale prices, as they will provide direct

international Internet connectivity for each of the mobile operators. The West Africa Cable System (WACS), of which MTN is a signatory, plans a launch in 2011.¹⁴ The Africa Coast to Europe (ACE) cable, with Orange Cameroon as a shareholder, is scheduled for launch in 2012.¹⁵ The national fiber-optic backbone, much of it built along the Chad-Cameroon oil pipeline, is being expanded with Chinese assistance.¹⁶

Table 13. Africa's ICT prices, 2008

US\$	Price per minute during peak time		Monthly Internet ADSL ^{a)}
	Region	US	
Without submarine cable	0.97	0.96	266
With submarine cable	1.07	0.63	89
-- <i>Monopoly on international gateway</i>	1.65	1.11	109
-- <i>Competitive international gateway</i>	0.45	0.28	65

Source: Foster and Briceño-Garmendia 2009.

a. 256 kbps connection.

Financing Cameroon's infrastructure

To meet its most pressing infrastructure needs and catch up with developing countries in other parts of the world, Cameroon must expand its infrastructure assets in key areas (table 14). The targets outlined below are purely illustrative, but they represent a level of aspiration that is not unreasonable. Developed in a standardized way across African countries, they allow for cross-country comparisons of the affordability of meeting the targets, which can be modified or delayed as needed to achieve financial balance.

Table 14. Illustrative investment targets for infrastructure in Cameroon

	Economic target	Social target
Transport	Achieve regional (national) connectivity with good-quality 2-lane (or 1-lane) paved roads.	Provide rural road access to 20 percent of the highest-value agricultural land, and urban road access within 500 meters
Irrigation	Develop an additional 170,463 hectares of economically viable small-scale irrigation	n.a.
WSS	n.a.	Achieve Millennium Development Goals and clear the rehabilitation backlog in the sector
Power	Develop 2,471 MW of new generation capacity and 831 MW of interconnectors (no-trade scenario).	Raise electrification to 71 percent (84 percent in urban areas and 49 percent in rural areas)
ICT	Install fiber-optic links to neighboring capitals and submarine cable	Provide universal access to GSM signal and public broadband facilities

Source: Mayer and others 2008; Rosnes and Vennemo 2009; Carruthers and others 2009; You and others 2009.

¹⁴ <http://www.reuters.com/article/idUSL896481320090408>

¹⁵ http://www.orange.com/en_EN/press/press_releases/cp100608en3.jsp

¹⁶ <http://www.balancingact-africa.com/news/en/issue-no-486/internet/cameroon-has-started-rolling-out-national-fibre-backbone-with-chinese->

Meeting these illustrative infrastructure targets for Cameroon would cost \$1.5 billion per year over a decade. Capital expenditure would account for 74 percent of this requirement. Power and water are the sectors with the greatest spending needs; each will require an estimated \$0.4 billion per year to meet the targets specified above. The transport sector will require about \$0.3 billion each year to build and rehabilitate roads and other modes of transportation. Around \$0.2 billion per annum will be required to provide sufficient connectivity and modern voice and broadband technologies in the ICT sector. Irrigation will require another \$0.09 billion annually (table 15).

Cameroon's infrastructure spending needs, while high in absolute terms, would absorb only 8.9 percent of GDP, among the lowest shares in the region (figure 27). Investment would account for about 6.6 percent of GDP, around half of what China invested in its infrastructure during the mid-2000s.

Cameroon already spends a sizable amount (\$0.9 billion per year) to meet its infrastructure needs (table 16). About 47 percent of that total is allocated to capital expenditure and 53 percent to operating expenditures. Operating expenditure is entirely covered from budgetary resources and payments by infrastructure users.

About 40 percent of capital expenditure funding comes from the federal and state governments and from state-owned enterprises (SOEs). Cameroon relies on private flows for about 35 percent of total capital spending on infrastructure in the ICT, power, and water sectors. Official development assistance (ODA) from the member states of the Organisation for Economic Co-operation and Development (OECD) plays accounts for about 21 percent of total capital spending, mostly for transport, water, and power. Non-

Table 15. Indicative infrastructure spending needs in Cameroon for 2006 to 2015

\$ million per year

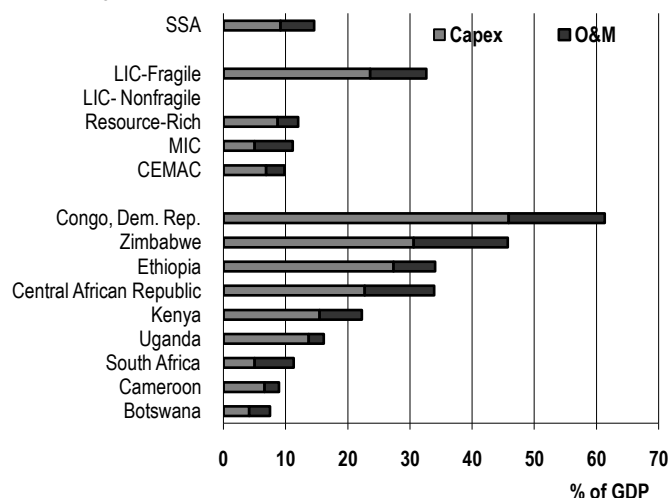
Sector	Capital expenditure	O&M	Total needs
ICT	109	64	173
Irrigation	88	3	91
Power (no-trade scenario)	381	73	454
Transport	205	122	328
Water supply and sanitation	311	123	434
Total	1,095	385	1,480

Source: Mayer and others 2008; Rosnes and Vennemo 2009; Carruthers and others 2009; You and others 2009.

Note: O&M= operations and maintenance.

Figure 27. Cameroon's infrastructure spending needs in the regional context

As percentage of GDP



Source: Foster and Briceño-Garmendia 2009.

Note: LIC = low-income countries; MIC = middle-income countries; ECOWAS = Economic Community of West African States; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M = operations and maintenance; CAPEX = capital expenditure.

OECD financiers account for around 4 percent of capital spending. Their presence is most pronounced in the transport sector.

Table 16. Financial flows to Cameroon's infrastructure, 2001-2006

\$ millions per year

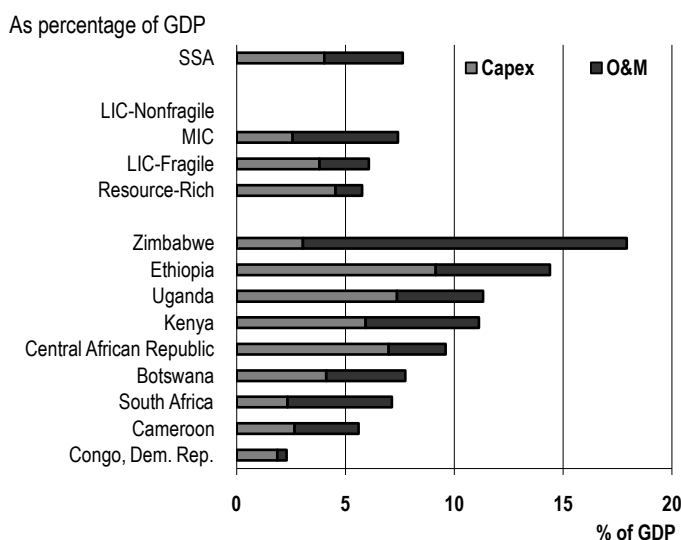
	O&M		Capital expenditure				Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total CAPEX	
ICT	90	100	3	0	76	179	270
Irrigation	3	0	0	0	0	0	3
Power	173	8	15	2	60	84	258
Transport	175	32	53	13	0	98	273
WSS	48	36	23	1	19	79	127
Total	490	176	93	16	156	440	930

Source: Derived from Foster and Briceño-Garmendia (2009).

Note: Financial flows are annual averages between 2001 and 2006. O&M = operations and maintenance; ODA = official development assistance; PPI = private participation in infrastructure; CAPEX = capital expenditure; OECD = Organisation for Economic Co-operation and Development; WSS = water supply and sanitation; ICT = information and communication technology.

Cameroon's current spending on infrastructure amounts to around 5.6 percent of GDP (figure 28), slightly less than the average spending in other resource-rich countries. Relative to this peer group, Cameroon is more heavily reliant on public spending in the ICT sector, but less reliant on public spending in the other infrastructure sectors. In comparison to peers, ODA plays a much more pronounced role in transport, while the power sector receives more private investment (figure 29). ICT, power, and transport in Cameroon each receive 28–29 percent of total infrastructure spending, and the water sector receives the remaining 14 percent.

Figure 28. Cameroon's infrastructure spending in regional context, 2001–06

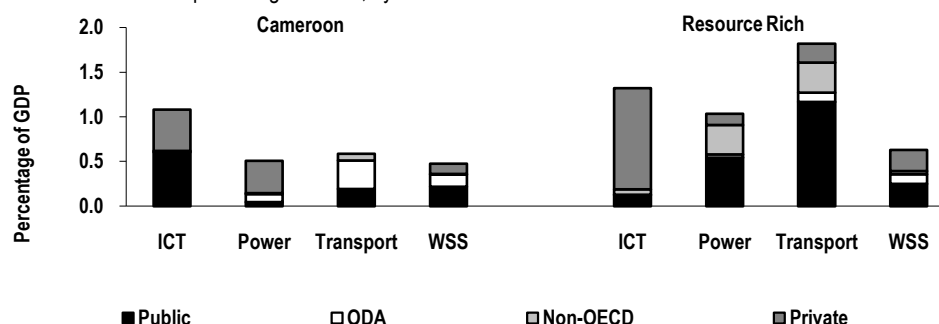


Source: Derived from Foster and Briceño-Garmendia (2009).

Note: Financial flows are annual averages between 2001 and 2006. LIC = low-income country; MIC = middle-income country; ECOWAS = Economic Community of West African States; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M = operations and maintenance; CAPEX = capital expenditure.

Figure 29. Patterns of capital investment in infrastructure, benchmarked against comparator countries

Investment in infrastructure sectors as percentage of GDP, by source



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Note: Private investment includes self-financing by households. Non-OECD financiers include China, India, and the Arab countries. ODA = official development assistance; OECD = Organisation for Economic Co-operation and Development; ICT = information and communication technology; GDP = gross domestic product; WSS = water supply and sanitation; LIC = low-income countries.

How much more can be done within the existing resource envelope?

Approximately \$586 million in additional resources could be recovered each year by improving efficiency (table 17). The largest potential source of efficiency gains is improving cost. Raising tariffs to cost-recovery levels could generate annual savings of \$266 million in the power sector and \$22 million in the water sector annually. Also, reducing operational and financial inefficiencies (distributional losses and undercollection of bills) in the power and water sectors could generate annual savings of around \$254 million. Looking across sectors, power-related efficiencies offer the greatest potential for savings—up to \$487 million per year (table 17).

Table 17. Cameroon's potential gains from greater operational efficiency

\$ million	ICT	Irrigation	Power	Transport	WSS	Total
Underpricing	-	n.a.	266	0	22	288
Overstaffing	n.a.	—	30	—	n.a.	30
Distributional losses	—	—	168	—	14	181
Undercollection	—	n.a.	21	33	19	73
Low budget execution	0	0	3	9	2	15
Total	0	0	487	43	57	586

Source: Derived from Foster and Briceño-Garmendia (2009).

Note: WSS = water supply and sanitation; ICT = information and communication technology.

— = Not available; n.a. = Not applicable.

Raising tariffs to cost-recovery

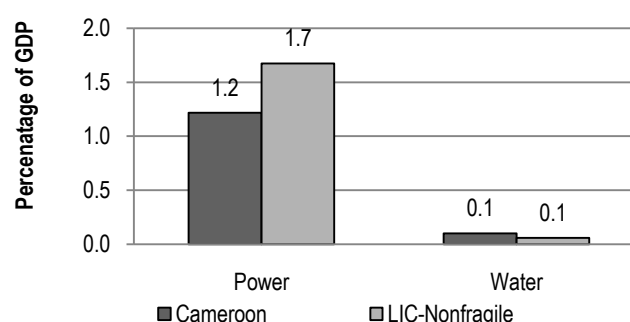
Setting tariff at a cost-recovery level in the power and water sector could generate the highest savings in Cameroon. About \$288 million could be saved if underpricing of power and water services is tackled (table 17). The high subsidies in the power and water prices are highly inequitable as the richest are the ones hook-up to the networks.

Although power underpricing costs Cameroon about \$266 million each year, or 1.2 percent of the country's GDP, Cameroon's power utility is actually doing better than the average for other resource-rich countries, where underpricing of power is commonplace (figure 30). It is estimated that the average historical cost of producing electricity is \$0.17 per kilowatt-hour in Cameroon, while the average effective tariff, as of 2009, was \$0.10.

Average tariffs charged by CDE, the water utility, stood at \$0.70 per cubic meter in 2009, far less than the estimated average cost-recovery tariff of \$0.97 per cubic meter. The macroeconomic burden of undercharging for water services is 0.1 percent of GDP, significantly lower than the burden imposed by undercharging for power, but still slightly higher than that in other resource-rich countries.

Figure 30. Underpricing of power and water in Cameroon

Financial burden of underpricing, as percentage of GDP

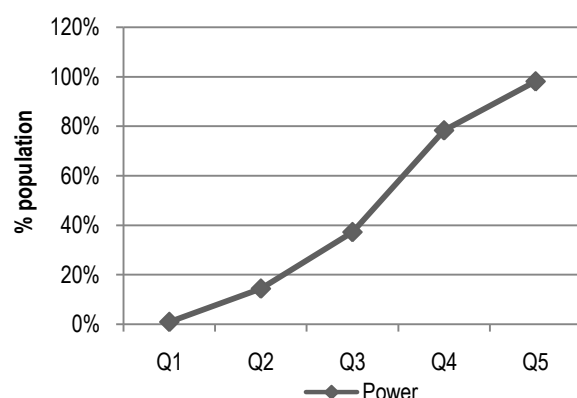


Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Note: GDP = gross domestic product; LIC = low-income country.

Figure 31. Household consumption of electricity in Cameroon is highly differentiated by income

Prevalence of connection to power grid among population, by income quintile



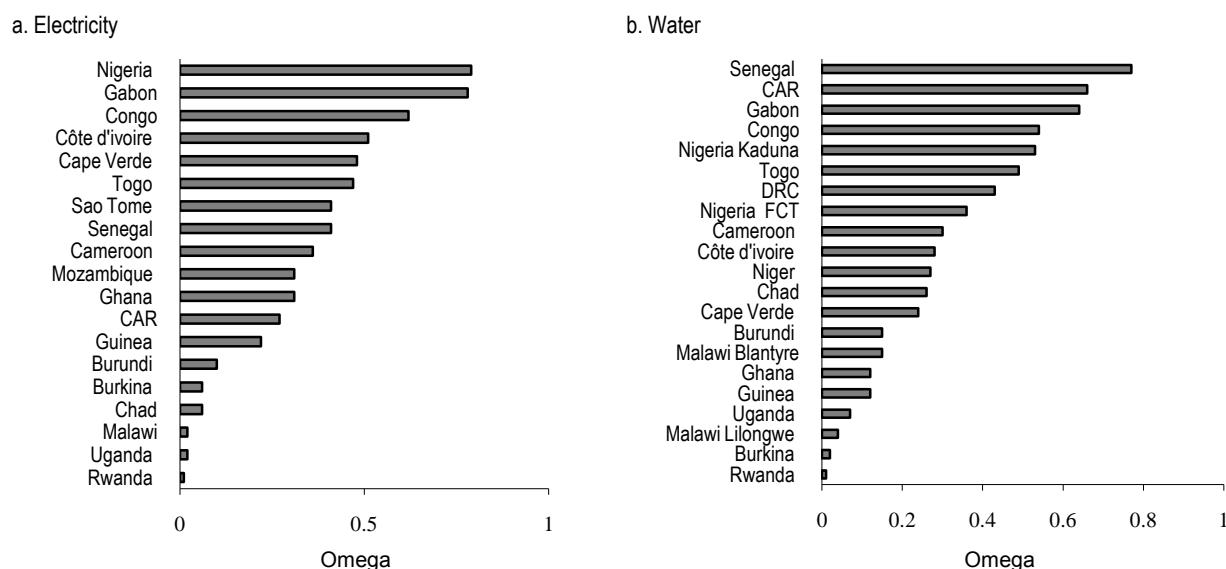
Source: Banerjee and others 2009.

Note: Q1 – first budget quintile, Q2 – second budget quintile, etc.

Because of inequitable access to power and water services in Cameroon, subsidized tariffs are regressive. The majority of households that have electricity belong to the top quintiles of the income distribution—indeed; household connections to the electricity grid are nonexistent for poorer households (figure 31). This inequitable distribution virtually guarantees that any price subsidy for power will be regressive, as is common in Africa for both power and water (figure 32).

How expensive would utility bills become if cost-reflective tariffs were applied? With a cost-recovery tariff of \$0.17 per kilowatt-hour and a monthly subsistence consumption of 50 kilowatt-hours, the associated utility bill would come to \$8.50 per month. Based on the distribution of

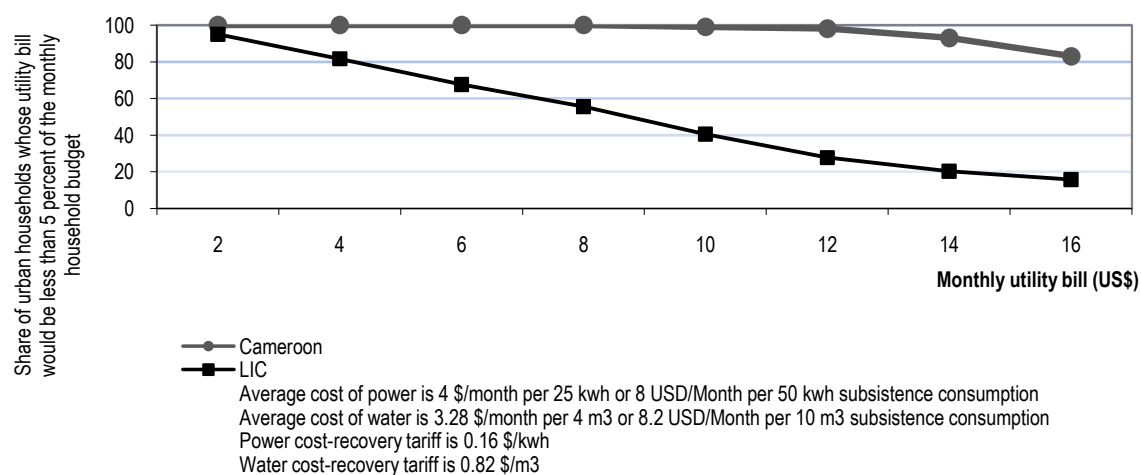
household budgets in Cameroon, monthly utility bills at these levels would be affordable to everyone (figure 33). A bill for subsistence consumption of 10 cubic meters of water would come to \$10 per month. The combined bill for electricity and water at these levels would be affordable to close to 80 percent of the population. A more limited level of subsistence consumption of 25 kilowatt-hours per month for power and 4 cubic meters per month for water—enough to meet the most basic needs—would cost \$4 per month each and would be affordable to 100 percent of the population.

Figure 32. Electricity and water subsidies that reach the poor

Source: Banerjee and others 2008a.

Note: Omega is a measure of distributional incidence, or the share of subsidies received by the poor as a percentage of their share in the population. The higher the value of omega, the better the distributional performance of the subsidy. Values of omega below 1 denote a regressive subsidy and values above 1 denote a progressive subsidy.

CAR = Central African Republic; DRC = Democratic Republic of Congo.

Figure 33. Affordability of electricity and water in Cameroon and in other low-income countries

Source: Banerjee and others 2009.

Note: LIC = low-income countries; kWh = kilowatt-hour.

Reducing operational and financial inefficiencies

Reducing operational and financial inefficiencies could save Cameroon around \$254 million per year (table 17), in particular by means of reducing distributional losses.

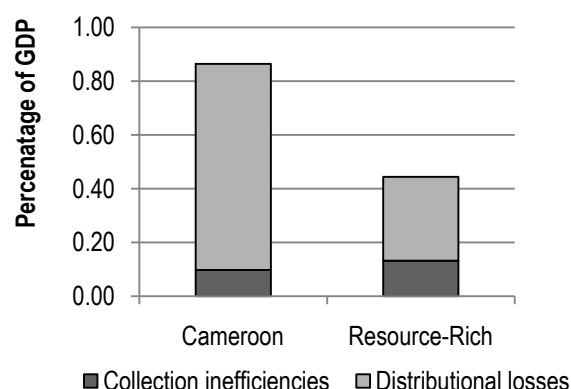
Reducing distributional losses in the power and water system could also contribute to expand the resource envelop. Around \$181 million could be saved if AES Sonel and CDE reduce the amount of power and water lost in their networks (table 17). Distributional losses of power cost the utility, AES SONEL, \$168 million per year (or 0.8 percent of GDP, figure 34a). The utility's 2009 losses of 35 percent are more than three times the best-practice benchmark of 10 percent. By reducing CDE's distributional losses of water from 34 percent (the level in 2009), to the 20 percent benchmark of a well-functioning utility, Cameroon could avoid economic losses of \$14 million (or 0.06 percent of GDP, figure 34b).

Undercollection of bills costs Cameroon around \$73 million per year. In the power sector, \$21 million per year (or 0.09 percent of GDP, figure 34a) could be saved by raising bill collection efficiency from 94 to 100 percent. In the water sector, improving bill collection ratio from 66 to 100 percent would save another \$19 million annually (or 0.08 percent of GDP, figure 34b).

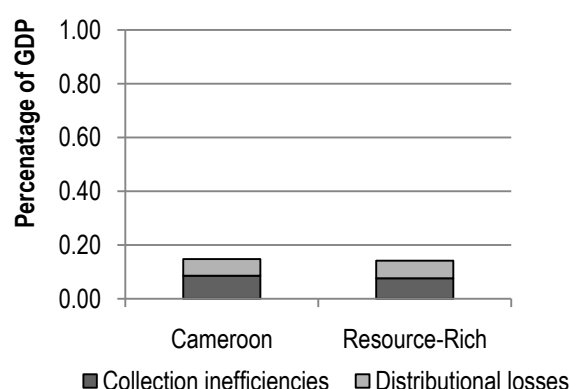
Figure 34. Macroeconomic burden of operational inefficiencies of Cameroon's power and water utilities

Uncollected bills and unaccounted losses as percentage of GDP

a. Power sector



b. Water sector



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Annual funding gap

Cameroon's infrastructure funding gap amounts to \$350 million per year, or about 2 percent of GDP, once efficiencies are captured. The bulk of the gap can be traced to the water, irrigation, and transport sectors (table 18). No funding gap is found in the ICT sector or, once large potential efficiency gains are captured, in the power sector.

Table 18. Funding gaps by sector

\$ millions

	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs	(173)	(91)	(454)	(328)	(434)	(1,480)
Existing spending	173	3	157	220	127	681
Reallocation potential within sectors	0	0	100	53	0	153
Efficiency gains	0	0	487	43	57	586
Funding gap	0	(88)	0	(12)	(250)	(350)
Reallocation potential across sectors	96	0	0	0	0	96

Source: Derived from Foster and Briceño-Garmendia (2009).

Note: Reported totals assume complete fungibility across sectors. Potential overspending across sectors is not included in the calculation of the funding gap, because it cannot be assumed that savings from elimination of overspending would be applied in other infrastructure sectors.

WSS = water supply and sanitation; ICT = information and communication technology.

What else can be done?

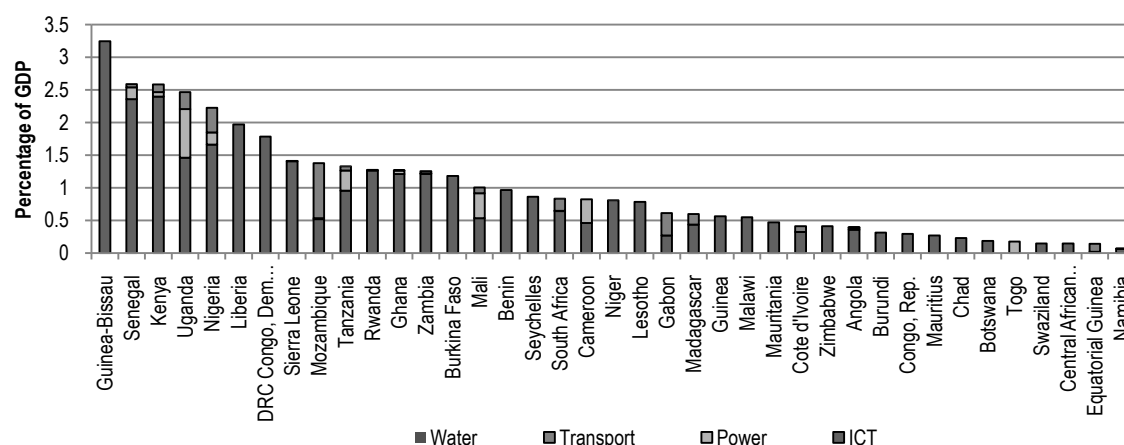
The funding gap can be addressed only by raising additional finance or, alternatively, by adopting lower-cost technologies or less-ambitious targets for infrastructure development.

In the case of Cameroon, there may be realistic prospects for increasing the flow of resources to all infrastructure sectors from private players and public sources.

Cameroon has already attracted a significant amount of private finance into infrastructure. In the early 2000s, Cameroon captured private investment commitments worth about 1 percent of its GDP, not only in the ICT sector but also in power. Many other African countries have done far worse in this area (figure 35). On the other hand, some—for example Nigeria, Uganda, Kenya, and Senegal—have done much better, attracting more than 2 percent of GDP in private finance for infrastructure.

Figure 35. Private sector participation

Average per year between 2002 and 2007



Source: AICD calculations.

Note: GDP = gross domestic product; ICT = information and communications technology.

Adopting lower-cost technologies could substantially reduce the cost of meeting the posited infrastructure targets and thereby reduce the funding gap. Meeting the Millennium Development Goals for water supply and sanitation with technologies (such as stand posts, boreholes, and improved latrines) that cost less than those previously used could reduce the associated price tag from \$434 million to \$362 million each year. Similarly, meeting transport connectivity standards using lower-cost road surfaces (such as single surface treatments) could reduce the associated price tag from \$328 million to \$196 million. The overall savings from these measures would amount to \$205 million, which would reduce the funding gap by 58 percent, underscoring the importance of technology choices (table 19).

Table 19. Savings from innovation

\$ millions					
	Funding gap before innovation	Funding gap after innovation	Savings	Savings as % of sector funding gap	Savings as % of total funding gap
Water supply and sanitation, low-cost technology	434	362	73	29	21
Roads, single surface treatment	328	196	132	1,092	38
Total	762	558	205	342	58

Source: Author's own calculations.

Finally, if all else fails, it may be necessary to extend the time horizon for meeting the infrastructure targets beyond the illustrative 10-year period considered here. Simulations suggest that even if Cameroon is unable to raise additional finance—but *is* able to eliminate inefficiencies—the identified infrastructure targets could be achieved over a 13-year horizon. However, without stemming inefficiencies, the existing resource envelope would not suffice to meet power infrastructure targets in the medium term.

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This country report draws upon a wide range of papers, databases, models, and maps that were created as part of the Africa Infrastructure Country Diagnostic. All of these can be downloaded from the project Website: www.infrastructureafrica.org. For papers go to the document page (www.infrastructureafrica.org/aicd/documents), for databases to the data page (www.infrastructureafrica.org/aicd/tools/data), for models go to the models page (www.infrastructureafrica.org/aicd/tools/models), and for maps to the map page (www.infrastructureafrica.org/aicd/tools/maps). The references for the papers that were used to compile this country report are provided in the table below.

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About AICD and its country reports

This study is a product of the Africa Infrastructure Country Diagnostic (AICD), a project designed to expand the world's knowledge of physical infrastructure in Africa. AICD provides a baseline against which future improvements in infrastructure services can be measured, making it possible to monitor the results achieved from donor support. It also offers a solid empirical foundation for prioritizing investments and designing policy reforms in Africa's infrastructure sectors.

The AICD is based on an unprecedented effort to collect detailed economic and technical data on African infrastructure. The project has produced a series of original reports on public expenditure, spending needs, and sector performance in each of the main infrastructure sectors, including energy, information and communication technologies, irrigation, transport, and water and sanitation. *Africa's Infrastructure—A Time for Transformation*, published by the World Bank and the Agence Française de Développement in November 2009, synthesized the most significant findings of those reports.

The focus of the AICD country reports is on benchmarking sector performance and quantifying the main financing and efficiency gaps at the country level. These reports are particularly relevant to national policy makers and development partners working on specific countries.

The AICD was commissioned by the Infrastructure Consortium for Africa following the 2005 G8 (Group of Eight) summit at Gleneagles, Scotland, which flagged the importance of scaling up donor finance for infrastructure in support of Africa's development.

The AICD's first phase focused on 24 countries that together account for 85 percent of the gross domestic product, population, and infrastructure aid flows of Sub-Saharan Africa. The countries are: Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Côte d'Ivoire, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zambia. Under a second phase of the project, coverage was expanded to include as many of the remaining African countries as possible.

Consistent with the genesis of the project, the main focus is on the 48 countries south of the Sahara that face the most severe infrastructure challenges. Some components of the study also cover North African countries so as to provide a broader point of reference. Unless otherwise stated, therefore, the term "Africa" is used throughout this report as a shorthand for "Sub-Saharan Africa."

The World Bank has implemented the AICD with the guidance of a steering committee that represents the African Union, the New Partnership for Africa's Development (NEPAD), Africa's regional economic communities, the African Development Bank (AfDB), the Development Bank of Southern Africa (DBSA), and major infrastructure donors.

Financing for the AICD is provided by a multidonor trust fund to which the main contributors are the United Kingdom's Department for International Development (DFID), the Public Private Infrastructure Advisory Facility (PPIAF), Agence Française de Développement (AFD), the European Commission, and Germany's Entwicklungsbank (KfW). A group of distinguished peer reviewers from policy-making and academic circles in Africa and beyond reviewed all of the major outputs of the study to ensure the technical quality of the work. The Sub-Saharan Africa Transport Policy Program and the Water and Sanitation Program provided technical support on data collection and analysis pertaining to their respective sectors.

The data underlying the AICD's reports, as well as the reports themselves, are available to the public through an interactive Web site, www.infrastructureafrica.org, that allows users to download customized data reports and perform various simulations. Many AICD outputs will appear in the World Bank's Policy Research Working Papers series.

Inquiries concerning the availability of data sets should be directed to the volume editors at the World Bank in Washington, DC.

